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A.S.M. REVIEW OF METAL LITERATURE

An Annotated Survey of Articles and Technical Papers Appearing in the Engineering, Scientific and Industrial Journals and Books Here and Abroad.

Volume 1

1944

Prepared for the Members of the American Society for Metals

by

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Published by

AMERICAN SOCIETY FOR METALS
CLEVELAND 3, OHIO

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American Society for Metals

Printed in U. S. A.

PREFACE

The A.S.M. Review of Current Metal Literature is a monthly feature of *The Metals Review,* published by the American Society for Metals and distributed to its members. The present volume is a collection of the installments published in *The Metals Review* from February 1944 through January 1945, and represents a complete survey of all of the metallurgical literature published during the period January through December 1944. The favorable reception accorded to this monthly service to A.S.M. members and the increasing value placed upon it indicated the desirability of publishing the annotations in bound form as a permanent reference work.

The annotations are not intended to serve as a substitute for a reading of the articles listed. They are rather brief abstracts designed to indicate the scope and content of the article so that you may determine whether it is something you want to read in its entirety.

Attention is called to the table of contents immediately following and to the subject index starting on page 642. The table of contents lists the various subdivisions and classifications with explanatory notes on each; this classification is arranged primarily by processes. The subject index supplants and greatly amplifies the "Materials Index" published in the monthly issues of *The Metals Review.* While the emphasis here is placed on materials, processes are likewise indexed in detail in this section of the book. Subheads and cross-references are included in sufficient detail to enable the location of articles on any specific subject related to the metal industry. Indexing is based on the content of the article and not merely on the title.

In using the book, if the primary interest is in the broad field of corrosion, or foundry practice, or welding, turn immediately to the respective section as given in the table of contents. If the main interest is in aluminum alloys, or copper, or cast iron, turn to the corresponding heading in

the subject index. If interest lies in specific aspects of corrosion, or a particular type of welding, these broad processes will be found broken down and subdivided in the subject index. An author index is also provided and a list of addresses of the publications annotated.

Every effort has been made to render the Metal Literature Review complete, so that in consulting it the reader can be assured that he is being referred to *all* of the material published during the prescribed period on the specific subject he is studying. The efforts of Thelma Reinberg and the cooperation of Battelle Memorial Institute in this respect, and the long hours of hard work expended in perfecting the index, are gratefully acknowledged.

AMERICAN SOCIETY FOR METALS

July 1, 1945

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1-1. Iron Concentration Tests Lick Hard-Water Problem. W. E. Keck and Paavo Maijala. *Engineering and Mining Journal,* v. 145, no. 1, Jan. '44, pp. 79-80.

Ore beneficiation research also finds way to float silica selectively without use of costly reagents in recovering hematite from a commercial washing plant tailing.

1-2. Possible Economies for Postwar Ore Reduction. Carle R. Hayward. *Engineering and Mining Journal,* v. 145, no. 1, Jan. '44, pp. 76-78.

Possible improvements are better materials-handling, maximum efficiency, more careful preparation of raw materials, fuel economies, improvement in design, better refractories, avoiding slag losses, and better handling of flue gases.

1-3. Reduce Postwar Milling Costs. A staff survey. *Engineering and Mining Journal,* v. 145, no. 1, Jan. '44, pp. 72-75.

Crushing costs can be lowered with more accurately-controlled feeding arrangements, use of better alloy steels, and improved crusher design. Grinding can be improved with a more efficient ball mill. Flotation design can enlarge the mechanical cell so large that 30 roughers and 10 cleaners could handle 25,000 tons daily of Morenci's Cu ore.

1-4. Ferro-Alloy Industry Keeps Pace with Production of All Types of Steel. George K. Herzog. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 70-72.

Brief survey of the ferro-alloy industry for 1943 with some discussion of changes made in the NE steels during the year.

1-5. Iron and Steel Production and Practice in the Two World Wars. C. D. King. *Mining and Metallurgy,* v. 25, Jan. '44, pp. 14-17.

Pig iron manufacture, improved ore fineness; steel ingot manufacture, bessemer practice.

1-6. The Physical chemistry of Open-Hearth Slags. J. White. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 60-61.

Discusses basic oxide systems and binary systems of SiO_2 with the basic oxides; ternary systems of SiO_2 with two basic oxides. Information available on SiO_2 basic oxide higher than ternary.

1-7. **Swedish Sponge Iron.** Einer Ameen. *Iron Age,* v. 153, no. 3, Jan. 20, '44, pp. 55-59, 150.

Wiberg process of low temperature reduction of iron ore by CO gas regenerated from carbonaceous material in an electric furnace. The Söderfors Works has perfected a furnace of 11,000 net tons annual capacity which has been in continuous operation since 1941. A complete analysis of all factors to be considered if this process can be used in U. S. A. Also detailed cost data.

1-8. **Metals and the War.** Clyde Williams. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 67-72.

Steel manufacture, Mn, Cr alloy steels, substitute metals: Cu, Zn, Al, Mg and Be developments discussed.

1-9. **Production of Aluminum From Clay.** F. W. Libbey. *Mining Journal,* v. 27, no. 14, Dec. 15, '43, pp. 5-8.

Development on a commercial scale of the metallurgy for the recovery of alumina. High-alumina clays may be the backbone of the U. S. aluminum industry.

1-10. **The Production of Aluminum From Blast Furnace Slags.** Wilhelm E. Drebs. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 52-53.

Remelting of bauxite in blast furnaces.

1-11. **New Tungsten Process.** *Science News Letter,* v. 45, no. 4, Jan. 22, '44, p. 52.

Pure, war-essential metal may be obtained directly from ore by electrolytic method which does not require preliminary transformation into alkali tungstate.

1-12. **Liquid Steel Temperatures in Basic Open Hearth Furnaces.** *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 78, 86.

Paper 23/'43 of the Committee on Heterogeneity of Steel Ingots, Iron & Steel Institute. Details of type of furnace and slag dealt with and temperature fluctuations during the progress of a heat.

1-13. **Swedish Sponge Iron.** Einer Ameen. *Iron Age,* v. 153, no. 4, Jan. 27, '44, pp. 56-65.

Operating data on the perfected sponge iron furnace put into operation at Soderfors in 1941 and analyzes sponge iron production costs in minute detail with charcoal, wood or coke as the source of CO gas employed in the reduction process. Comparisons are also made of cost of pig iron produced in a shaft type electric furnace and the Tysland-Hole electric furnace. Cost data are also shown for carbon steel produced in the electric furnace with varying portions of sponge iron. Although the present unit is of 10,000 metric tons annual capacity, a 20,000-ton unit is projected.

1-14. **New Methods for the Production of Magnesium.** L. M. Pidgeon. *Canadian Mining & Metallurgical Bulletin,* no. 381, Jan. '44, pp. 16-34 (Trans.).

Production methods and Canadian production.

1-15. **Thermal Processes for the Production of Magnesium.** D. D. Howat. *Engineers' Digest,* v. 1, no. 2, Jan., '44, pp. 11-17.

Hansgirg process, Permanente plant, and patented developments in thermal production and distribution.

1-16. **Ore Concentration and Milling.** T. B. Counselman. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 57-60.
Wider use of sink and float processes—important new installations and research for iron ore treatment.

1-17. **Reduction of Ferro-Alloy Ores.** Gilbert E. Seil. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 76-77.
Much current technologic progress but details held for postwar release.

1-18. **Metallurgy of Copper.** Joseph Newton. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 69-70.
Maximum capacity utilized with no major changes in smelting or refining practice.

1-19. **Melting and Pouring Magnesium.** M. E. Brooks. *Foundry,* v. 72, no. 2, Feb. '44, pp. 124, 193-194.
Melting equipment, and modern practice in melting, fluxing and pouring magnesium in sand.

1-20. **Making Electric Furnace Steel.** Victor E. Zang. *Steel,* v. 114, Feb. 21, '44, pp. 88, 110.
Larger percentages of alloy steel scrap used in electric furnaces as a means of relieving the pressure on carbon steel scrap.

1-21. **Aluminum Manufacture in the Pacific Northwest.** *Western Metals,* v. 2, Feb. '44, pp. 17-18.
Production in the U. S. Six plants represent $116,000,000 investment.

1-22. **Some Aspects of Sintering Iron Ores.** R. Hay and J. McLeod. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 214-217.
An investigation of composition and procedure.

1-23. **Production of Magnesium by the Carbothermic Process.** T. A. Dungan. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1671, 7 pages.
Direct reduction, Permanente plant, magnesia reduction by carbon, sublimation.

1-24. **Changes and Improvements in Modern Copper Smelting.** R. A. Wagstaff. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1669, 9 pages.
Milling, roasting, changes in smelting operations, direct smelting, charging, deep-bath smelting, life and operation of plants, metallurgical control, waste-heat boilers, tuyere linings, and balance.

1-25. **Special Addition Agent Steels Are Our Safeguard.** R. B. Schenck. *Blast Furnace and Steel Plant,* v. 32, Feb. '44, pp. 239-240.
Improvement of steels of the future and safeguarding threat of shortage of Ni, Cr, Mo, etc.

1-26. **Recent Developments in Magnesium Production.** H. R. Leech. *Magnesium Review and Abstracts,* v. 3, Oct. '43, pp. 120-124.
Pre-war development; American development; Basic Magnesium, Inc., sea-water processes, Permanente Plant; Pidgeon process; British Dominions.

1-27. **Cold-Blast Irons Duplicated by Synthetic Mixtures.** J. E. Hurst. *Iron Age,* v. 153, no. 7, Feb. 17, '44, pp. 74-76.
Differences between the characteristics and properties of cold-blast pig irons and other types of pig irons

have been observed and experimentally investigated. Results in part answer the question propounded by Sweetser in "What is the 'It' in Charcoal Pig Iron" (*Iron Age*, July 1, '43).

1-28. **Flexibility Is Basic Characteristic of Aluminum Industries Operations.** Joseph Geschelin. *Automotive and Aviation Industries,* v. 90, Feb. 1, '44, pp. 20-23, 58, 62, 64.

Production output of Aluminum Industries, Inc.

1-29. **Some Aspects of Sintering Iron Ores.** R. Hay and J. McLeod. *Iron & Steel,* v. 17, Feb. '44, pp. 250-253.

Composition and procedure. 8 ref.

1-30. **Iron v. Scrap.** *Pig Iron Rough Notes,* no. 96, Winter, pp. 3-4.

Why the use of pig iron is more economical than scrap.

1-31. **Concerning Iron & Its Alloys.** F. E. Fisher. *Pig Iron Rough Notes,* no. 96, Winter, pp. 20-26.

Data relative to the production of iron and some of the fundamentals concerning its alloys, all of which have iron ore as their basis.

1-32. **Blast Furnace Moisture Control Study.** John J. Alexander. *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 346-351.

The influence upon the furnace operation and pig iron analyses of maintenance of uniform blast moisture. To establish the performance on natural air, furnace and atmospheric data were obtained for test periods. Conditions of test given. Results prove benefits outweigh costs.

1-33. **Electric Furnace Smelting of Tin Concentrate from Sullivan Ore.** E. L. Jones and A. Thunaes. *Canadian Mining and Metallurgical Bulletin,* no. 382, Feb. '44, pp. 35-43.

Description of the highlights of smelting Sullivan tin concentrate, using an electric furnace process developed in Trail.

1-34. **Molybdenite in Canada.** H. H. Claudet. *Canadian Mining & Metallurgical Bulletin,* no. 383, March '44, pp. 87-98.

Metallurgy, uses and milling of molybdenite; occurrence in Canada.

1-35. **Proper Deoxidation Practice Improves Quality of Bessemer Converter Steel.** *Industrial Heating,* v. 11, March '44, pp. 406, 408.

The development of "killed" bessemer steel, a process which thoroughly deoxidizes the steel.

1-36. **Golden Manitou — New Zinc Producer.** Andrew Robertson. *Engineering & Mining Journal,* v. 145, March '44, pp. 74-79.

Geology and mineralogy, development, mining method, mucking-machine stopes, ring drilling, recovering ore left in vertical pillars, haulage and hoisting, ore treatment, and flowsheet.

1-37. **Chlorine as a Solvent in Gold Hydrometallurgy.** Garth L. Putnam. *Engineering & Mining Journal,* v. 145. March '44, pp. 70-73.

Disadvantages of cyanidation and methods of chlorination. 31 ref.

1-38. **Neglected Copper-Zinc Belt Revived Under War Demands.** John B. Huttl. *Engineering & Mining Journal,* v. 145, March '44, pp. 60-63.
Mill flowsheet Keystone Copper Corp.

1-39. **Magnesium Sources and Manufacture.** *Westinghouse Engineer,* v. 4, March '44, pp. 46-50, 56.
No nation can ever monopolize the sources of magnesium. Among metals it is surpassed in prevalence only by Fe and Al. It occurs in many ores, profusely scattered in large quantities over the earth. No nation that has a seacoast can be denied a supply of magnesium. Although the magnesium concentration in sea water is but 0.13%, each cubic mile of the ocean contains 4½ million tons; each 100 gallons contains about a pound.

1-40. **MacIntyre Development of National Lead Company at Tahawas, New York.** *Mines Magazine,* v. 34; Feb., '44, p. 68-71, 77.
Flow sheet; concentrating the ore, metallurgical problems, power and maintenance.

1-41. **The Spanish Metallurgical Industries.** *Chemical Age,* v. 50, March 4, '44, pp. 233-234.
Future of the steel industry.

1-42. **Vanadium Operations at Monticello, Utah.** *Mining World,* v. 6, March '44, pp. 17-21.
Erected in the heart of the largest vanadium producing area in the U. S., the Monticello plant is operated for Metals Reserve by Vanadium Corp. of America.

1-43. **Quail Hill,** *Mining World,* v. 6, March '44, p. 22.
California's largest zinc producer in 1943.

1-44. **Benefication of Alumina Clays.** *Light Metal Age,* v. 2, March '44, pp. 22-24.
Methods by which Washington residual clays may be concentrated to increase their alumina content.

1-45. **Segregation in Alloy Ingots and Large Castings.** S. W. Poole. *Metal Progress,* v. 45, April '44, pp. 692-695.
An interplay of ideas derived from the theoretical progress of leisurely solidification of solid solution alloys, and the actualities of the situation as determined in melting shop and casting aisle, clarifies the puzzling occurrences of less-than-normal segregation—even negative segregation.

1-46. **Iron Ores of the Pacific Northwest.** Carl Zapffe. *Steel,* v. 114, April 10, '44, pp. 116, 118, 136, 138, 141.
Iron ores in Washington and Oregon are uncommon to the steel industry because they have not been subjected to adequate metallurgical tests nor the physical properties of resultant metallic determined. While they are unsuited to present-day steelmaking practice, yet there is the likelihood they will find application in electrothermic processes for making new products.

1-47. **Mine to Market.** *Business Week,* April 15, '44, pp. 60, 62.
New rail connection will speed delivery of ilmenite

and concentrated iron ore, promote Adirondack area development.

1-48. **The Role of Basic Slags in the Elimination of Phosphorus from Steel.** Richard L. Barrett and William J. McCaughey. *Metals Technology,* v. 11, April '44, Tech. Pub. 1716, 8 pp.

Petrographic study; solid solution of calcium silicates and phosphates; mineralogical constitution of slag; removal of phosphorus.

1-49. **Increased Open-Hearth Productivity.** C. D. King. *Metals & Alloys,* v. 19, April '44, pp. 850-855.

Melting time vs. outages, furnace rebuilding, operating delays, bank and bottom repairs, charging delays, hot work repairs, teamwork boosts productivity.

1-50. **Stepping Up Blast Furnace Blowouts.** John D. Knox. *Steel,* v. 114, April 24, '44, pp. 110-112, 144.

After last cast debris is removed quickly by hydraulic means, salamanders are drained through passageway drilled in foundation masonry. Flushing eliminates dust nuisance, facilitates refractory removal, saves considerable labor and affords quicker start on tearout.

1-51. **Why Use Cold Blast Charcoal Iron?** W. H. Melaney. *Blast Furnace & Steel Plant,* v. 32, April '44, pp. 471, 480.

Why use cold blast iron and desirable qualities.

1-52. **Automatic Control Features Zinc-Fuming Plant.** B. H. Hodgins. *Engineering & Mining Journal,* v. 145, April '44, pp. 88-90.

Designed to permit recovery of zinc both from current operations and from waste dumps, the plant is served electrically from a central substation situated near the center of the load.

1-53. **Impact of the War on Nevada Mining and Metallurgical Operations.** Joy A. Carpenter. *Mining and Metallurgy,* v. 25, May '44, pp. 251-253.

Mining is the principal industry in Nevada. Of the current developments, the most important, with a likely postwar future, is the $130,000,000 Basic Magnesium enterprise, which, in two days, can produce as much as the entire American annual output 13 years ago.

1-54. **Nicaro Nickel's New Cuban Plant Begins Production.** *Mining and Metallurgy,* v. 25, May '44, pp. 254-256.

A new source of this metal has been started by the Nicaro Nickel Co., subsidiary of the Freeport Sulphur Co.

1-55. **Mineral Composition of the Tin Ores of Renison Bell Tasmania.** F. L. Stillwell and A. B. Edwards. Australasian Institute of Mining and Metallurgy *Proceedings,* Nos. 131 and 132, Sept.-Dec. 1943, pp. 173-186.

Mineral composition; non-sulphide gangue minerals; oxidation. 6 ref.

1-56. **Hecla's California Project Red Cloud Mines Inc.** *Mining World,* v. 6, April '44, pp. 11-13.

Conversion of the Jenny Lind gold concentrator by the Hecla Mining Co., to handle complex zinc-lead ore from the Blue Moon claims, gives California its first major zinc operation in many years.

1-57. **Rimming Steel.** T. Swinden, W. W. Stevenson, and G. E. Speight. *Metallurgia* v. 29, March '44, pp. 249-253.

Experimental work on five casts of rimming steel, in the range of pit sample carbon analyses 0.04 to 0.14%. A study has been made of the variations in carbon and oxygen in relation to the balanced composition as modified by the presence of manganese and the effect of pressure. 17 ref.

1-58. **Gold and Silver Winning by Amalgamation.** Douglas Rennie Hudson. *Metallurgia,* v. 29, March '44, pp. 255-261.

Development of mining, amalgamation extraction, and applications of gold, silver and mercury from prehistoric time.

1-59. **Nodulizing Iron Ore.** Gilbert E. Seil. *Iron Age,* v. 153, April 27, '44, pp. 40-46.

Nodulizing in rotary kilns has been little used for the preparation of iron ore as compared to sintering. This method has certain advantages over the static process of partial fusion. A comparison of operations and costs and suggestions for improved results from rotary kilns.

1-60. **New Caledonian Nickel.** W. H. Dennis. *Mine and Quarry Engineering,* v. 9, April '44, pp. 96-97.

Absence of copper, sulphur and precious metals simplifies recovery of metal and renders unnecessary a complicated smelting operation.

1-61. **The Metallurgy of Molybdenum.** L. G. Whybrow Palethorpe. *Chemical Age,* v. 50, April 1, '44, pp. 315-317.

Importance in iron and steel alloys. Natural sources, properties and uses of molybdenum, chemical uses, iron and steel industry, types of molybdenum steel.

1-62. **The Relation of Open-Hearth Practice to Segregation in Rimmed Steel.** J. W. Halley and G. L. Plimpton. *Blast Furnace & Steel Plant,* v. 32, May '44, pp. 539-546, 550.

Segregation in rimmed steel from the standpoint of the mechanisms which produce it and survey of the phases of open-hearth practice which influence those mechanisms.

1-63. **Basic Magnesium, Inc.** *Western Metals,* v. 2, May '44, pp. 7-12.

The story of America's desert giant.

1-64. **The Carbothermic Process of Magnesium Production.** *Western Metals,* v. 2, May '44, pp. 36-37, 39.

The carbothermic method employs carbon and heat. Three principal elements in the Permanente operations; The dolomite quarry and calcining plant at Natividad, the sea water treatment tanks at Moss Landing and the reduction plant at Permanente.

1-65. **Sponge Iron Has Definite Place in Postwar Picture.** Walter A. Janssen. *Steel*, v. 114, May 22, '44, pp. 94, 145-148.

Will be a "must" in making special grades of both carbon and alloy steels since dilution of scrap with alloying elements makes it necessary for steel producers to use more virgin materials. Sponge iron will be made available in tonnages comparable to ferro-alloys.

1-66. **Tantalite from Brazil.** *Mining Journal*, v. 27, May 15, '44, pp. 5-7.

Military uses for tantalum are military secrets; increasing quantities are being used in the manufacture of certain alloys.

1-67. **Manganese.** D. D. Howat. *Mine & Quarry Engineering*, v. 9, May '44, pp. 107-113, 118.

Developments in the recovery from low-grade ores. 10 ref.

1-68. **Gold and Silver Winning by Amalgamation.** Douglas Rennie Hudson. *Metallurgia*, v. 29, April '44, pp. 299-303.

Some previous explanations of the amalgamation process of gold winning are shown to be ill-found theoretically. Quantitative determination shows that a mercury layer about 2.2 x 10^{-4} cm. in thickness is enough to impart the typical greasiness and high reflecting power to gold.

1-69. **Recent Developments in Steelmaking.** J. Edmiston. *Metallurgia*, v. 29, April '44, pp. 304-306.

Considerable attention has been given to the whole field of alloy steel consumption, and to schedule the various compositions and properties which apply to different uses, steelmakers have concentrated on maximum production of improved quality steel. Reviews some aspects of production and directs particular attention to the increased application of electric furnaces and to improvements in the production of clean steel.

1-70. **Beneficiation of Arkansas Bauxite.** S. M. Runke and R. G. O'Meara. *Mining Technology*, v. 8, May '44, T.P. 1698.

Processes for the production of alumina from low-grade bauxite, aluminite, and clay. Application of ore-dressing methods to improve the grade of high silica bauxite. Data obtained and detailed results of tests.

1-71. **Canadian Magnesium.** G. L. White. *Canadian Metals & Metallurgical Industries*, v. 7, May '44, pp. 20-23.

Development of the Pidgeon ferrosilicon process for the production of magnesium and its use by Dominion Magnesium, Ltd.

1-72. **Fontana Steel Mill.** *The Architectural Forum*, May '44, pp. 61-68.

Architecture, design and construction of new Kaiser plant.

1-73. **An Investigation of Copper Losses in Copper Reverberatory Slags.** A. M. Aksoy. Thesis for D.Sc. degree, Massachusetts Institute of Technology, 1943.

1-74. **Equilibria in the Reduction of Chromic Oxide by Carbon, and Their Relation to the Decarburization of**

Chromium and Ferrochrome. F. S. Boericke. Bureau of Mines Report of Investigations 3747, June 1944.

Methods employed and results obtained in determining necessary, and previously unavailable, reliable fundamental data concerning the carbides of chromium. Application of the fundamental data to the decarburization of chromium and ferrochrome.

1-75. **Rimming Steel—Experiments on Melts of Rimming-Steel Composition in the Laboratory High Frequency Furnace.** T. Swinden, W. W. Stevenson, and G. E. Speight. Iron & Steel Institute, Advance Copy, April '44, 10 pp.

Using a small high-frequency melting unit (nominal capacity, 18 lb. of metal), experiments were conducted in an endeavor to reproduce the conditions prevailing during the freezing of commercial rimming-steel ingots. Owing to the small mass of material involved this was not completely possible, but some interesting observations were made. A noticeable feature was the invariable appearance of a thick crust of pure "rim" at the top of the ingots.

1-76. **Some Notes on Slags and Slag Control in Basic Open-Hearth Tilting Furnaces Using Phosphoric Iron.** A. Jackson. Iron & Steel Institute, Advance Copy, April '44, 18 pp.

Chronological development of a slag control method, designed first for use during refining, but subsequently enlarged to embody also the charging of lime in furnaces using high percentages of molten phosphoric iron. Conclusions point to some increased production resulting from the application of the methods outlined, but in particular indicate slag control to be one more step towards attaining uniformity of operation and product in the basic open-hearth.

1-77. **Water Into Fire: The Story of Magnesium.** A. Buirski. *Refractories Journal,* v. 20, April '44, pp. 166, 169-170.

Production and uses of magnesium.

1-78. **Calcium and Magnesium.** Glen D. Bagley. *Chemical & Engineering News,* v. 22, June 10, '44, pp. 921-924, 958, 960.

Development of the Electro Metallurgical Co.'s processes for their production.

1-79. **The Melting of Brass and Bronze.** *Industrial Heating,* v. 11, June '44, pp. 914, 916, 918, 920.

Crucible furnace melting, cupola melting of nonferrous metals, arc-type electric furnaces, low frequency induction furnaces, high frequency induction furnaces, open-flame melting.

1-80. **The Manufacture and Properties of Killed Bessemer Steel.** E. C. Wright. *Metals Technology,* v. 11, June '44, T.P. 1692, 17 pp.

Results of investigations are based on at least five years of testing on thousands of heats of steel. Yield strength and fatigue properties of killed bessemer steel are superior to those of open-hearth steel of the same tensile strength; ductility and toughness, cleanliness

and carburizing qualities are about equal to open-hearth of similar grades and ease of welding is better than for open-hearth of same tensile strength. 5 ref.

1-81. **Operation of the Fontana Plant of the Kaiser Company, Inc., Iron and Steel Division.** T. M. Price. *Blast Furnace & Steel Plant,* v. 32, June '44, pp. 675-682, 688.

Raw materials, coke plant, blast furnace, open hearth, mills.

1-82. **The Relation of Open Hearth Practice to Segregation in Rimmed Steel.** J. W. Halley and G. L. Plimpton. *Blast Furnace & Steel Plant,* v. 32, June '44, pp. 683-688.

Effect of mold size and shape on the rate of solidification; capping practice; examples of segregation in rimmed ingots. 11 ref.

1-83. **Nodulizing of Iron Ore.** Gilbert E. Seil. *Skillings Mining Review,* v. 33, June 17, '44, pp. 1-2, 4, 6, 15.

History, comparable processing, comparison of a sintering plant with a rotary kiln nodulizing plant, comparison of materials charged, comparison of products of the sintering machine and the nodules from the rotary kiln, comparison of cost of operation, estimated cost sheet, a theory covering conditions affecting the operation of rotary kilns.

1-84. **Kaiser's Stake in the Magnesium Industry.** S. D. Kirkpatrick. *Chemical & Metallurgical Engineering,* v. 51, June '44, pp. 104-106.

The "bugs" worked out of the carbothermic process. Meanwhile vast new raw material sources have been uncovered and several valuable products and byproducts developed for war uses.

1-85. **The Extraction of Indium from Lead-Tin Bullion.** John Coyle. Electrochemical Society Preprint 85-19, 7 pp.

A procedure is described by which indium may readily be extracted from molten complex lead-tin alloys by treatment at moderate temperatures under a fused mixture of lead and zinc chlorides. A qualitative survey is presented of other methods, including electrolysis, by which similar results may be accomplished.

1-86. **A Survey of Slag Control Methods.** W. O. Philbrook and A. H. Jolly. *Blast Furnace & Steel Plant,* v. 32, July '44, pp. 793-797.

Summary of a study of slag control methods. Following techniques investigated: (1) Visual inspection of pancake samples; (2) visual examination of powdered slags; (3) microscopic examination of polished slag samples; (4) measurement of the basicity of suspensions of powdered slag in distilled water; and (5) attempts to determine "free Ca" by chemical methods similar to those used for cement clinker.

1-87. **Raw Material Mining and Beneficiation at Kaiser Company, Inc., Iron & Steel Division, Fontana.** T. M. Hart. *Blast Furnace & Steel Plant,* v. 32, July '44, pp. 798-802.

Mining and treatment of coal and iron ore; ore bedding; blast furnace.

1-88. **Some Aspects of Commercial Production of Alloy Steels to Hardenability Requirements.** W. G. Bischoff. *Blast Furnace & Steel Plant,* v. 32, July '44, pp. 803-806.

Cast tests vs. forged test results; comparison between positions in heat; correlation between various laboratories; hardenability as calculated from chemistry compared to actual results obtained.

1-89. **Steel Melting.** A. H. Leckie. *Iron & Steel,* v. 17, May 18, '44, pp. 383-390.

Fuel losses can be avoided by simple means which do not involve major alterations—more frequent use of the damper, better control of gas flow, good maintenance of doors, sills and ports, the use of insulation and the avoidance of short-circuiting during reversals. 7 ref.

1-90. **Rimming Steel.** T. Swinden, W. W. Stevenson, and G. E. Speight. *Iron & Steel,* v. 17, May 18, '44, pp. 419-421.

Examination of the carbon and oxygen relationship in the solidification of basic open-hearth steel.

1-91. **Making Electric Furnace Aircraft Steels.** *Industrial Heating,* v. 11, July '44, pp. 1102-1108.

Advantages of electric furnaces; furnace design; charging and melting down; procedure for typical heat; alloy recovery.

1-92. **Slag Control.** A. Jackson. *Iron & Steel,* v. 17, June '44, pp. 498-500.

Notes on basic open-hearth tilting furnaces using phosphoric iron.

1-93. **Smelting Magnesium.** Wilfred B. Griffin. *Light Metal Age,* v. 2, July '44, pp. 17-18.

Recommended methods for all phases of this operation; impurity tolerance, and the quality of metal to be expected.

1-94. **Degassing Aluminum.** James Erickson. *Light Metal Age,* v. 2, July '44, pp. 19-22.

Gases present in aluminum; the Al-H system (gas-metal alloy); entrance of gases into the metal; solubility of H and Ni in Al; methods for the removal of H from Al melts; degassing by the use of an inert gas: nickel; methods advocated for the removal of gases from aluminum and its alloys; chlorination; chlorides.

1-95. **Zinc Producer from Gold Prospect.** John B. Huttl. *Engineering & Mining Journal,* v. 145, July '44, pp. 82-84.

U. S. Smelting's Bayard property in New Mexico is contributing to metal output.

1-96. **Double Pick-Up Features New Magnetic Separator.** *Engineering & Mining Journal,* v. 145, July '44, p. 85.

Additional magnet bank said to give iron-ore concentrator approximately twice the capacity of a single-bank machine.

1-97. **Preheater Improves Results at Chino Smelter.** John B. Huttl. *Engineering & Mining Journal,* v. 145, July '44, pp. 92-93.

Better combustion in the reverberatory without supplementary burners. A higher over-all efficiency results.

1-98. **Emerald Tungsten.** *Mining World,* v. 6, July '44, pp. 15-18.

Second largest of six major tungsten projects of sound economic basis developed in North America during the war period closed by the Canadian government when war requirements were met, the character of its ore body establishes Emerald as a major factor in the post-war mineral production field.

1-99. **Iron Ore for California Steel.** F. Conrad. *Mining Journal,* v. 28, July 30, '44, p. 9.

Close to 2500 tons of iron ore are being shipped each day from the Vulcan to the Fontana, Calif., plant for conversion into steel plate.

1-100. **Postwar Prospects for Basic Electric Furnace Steel.** Frank T. Sisco. *Iron Age,* v. 154, July 27, '44, pp. 34, 35, 130, 132-134, 137.

Technology and economics of electric furnace steels.

1-101. **The Manufacture of Electric Furnace Pig Iron.** Charles Hart. *Steel,* v. 115, August 7, '44, pp. 111-114, 140.

Electric furnaces in Europe used for smelting iron ore are cylindrical crucibles with gas-tight tops. One day's output always remains in hearth and insures uniform metal at each cast. Highly basic slags are carried. One ton of pig made with 700 lb. of inferior fuel, 2000 kw. of energy and 2 man-hours of labor.

1-102. **Sponge Iron—Its Possibilities and Limitations.** C. F. Ramseyer. *Iron & Steel Engineer,* v. 21, July '44 pp. 35-44, 72.

Modern sponge iron processes; factors in the reduction of iron ore; use of fine ore; use of gas under pressure; hydrogen as a reducing gas; design factors; coke oven gas as source of hydrogen; the Herreshoff furnace with bottom slotted hearth; production and use of pure hydrogen; the bubble cap ore reduction furnace or column; comparison with blast furnace practice.

1-103. **The Cupola Method of Melting Bronze.** Charles R. Gregg. *Western Metals,* v. 2, August '44, pp. 24-25.

Controlling and measuring the air blast, measuring the coke bed height and amount used on charges, the melting or resulting temperature of bronze in the hearth can be closely controlled.

1-104. **A Survey of Slag Control Methods.** W. O. Philbrook and A. H. Jolly, Jr. *Blast Furnace and Steel Plant,* v. 32, August '44, pp. 938-942.

Five possible methods of estimating slag composition for open-hearth control purposes were investigated; the chemical analysis of the slag was used as the basis of comparison.

1-105. **Plant for Production of Magnesium by the Ferrosilicon Process.** Andrew Mayer. *Metals Technology,* v. 11, August '44, T. P. 1670, 14 pp.

Description of process, plant layout, equipment and operations, and flow sheets.

1-106. **Alumina from Clay by the Lime-sinter Method.** F. R. Archibald and C. F. Jackson. *Metals Technology,* v. 11, August '44, T. P. 1706, 12 pp.

The Ancor Process and its proposed application in treatment of clay, by the Defense Plant Corp.

1-107. **The Melting and Refining of Magnesium.** C. E. Nelson. *Metals Technology,* v. 11, August '44, T. P. 1708, 13 pp.

The practices commonly followed in this country for the melting and refining of magnesium and its alloys. 5 ref.

1-108. **The Kalunite Process.** Arthur Fleischer. *Metals Technology,* v. 11, August '44, T. P. 1713, 13 pp.

Production of aluminum; behavior of potassium alum; basic alum reaction.

1-109. **First Two Years Operation of the Bureau of Mines Electrolytic Manganese Pilot Plant at Boulder City, Nevada.** J. H. Jacobs, J. W. Hunter, W. H. Yarroll, R. E. Churchward and R. G. Knickerbocker. *Metals Technology,* v. 11, August '44, T. P. 1717, 21 pp.

A chapter in the history of the development of an electrolytic manganese industry in the United States; development of the process; the pilot plant; ore; crushing and grinding; roasting; leaching; purification; electrolysis; design of cell and frame; anodes; cathodes; diaphragms; solution concentrations; effect of cell pH; cell temperature; addition agents; effect of solution impurities. 7 ref.

1-110. **Climax Conversion Practice.** E. S. Wheeler. *Metals Technology,* v. 11, August '44, T. P. 1718, 11 pp.

Chronology of plant development; roasting department; production of ferro-alloys; chemicals.

1-111. **The Constitution of Some Basic Open-Hearth Slags.** Brian Mason. *Engineering,* v. 157, June 30, '44, pp. 515-516.

Petrographic examination of solid slags showing the phases present.

1-112. **The Production of Steel Direct From Ore by the Hearth Furnace Method.** Albert E. Greene. *Mining World,* v. 6, August '44, pp. 31-32, 34.

Discussion of the operation and method. Advantages are: Hearth furnace can use almost any variety of coal in fine form, does not require coke, uses a small amount of electric energy and produces steel direct.

1-113. **Magnesium Metal From Carlsbad Potash.** *Engineering & Mining Journal,* v. 145, August '44, pp. 70-75.

Recovering the entire ultimate values in products from ore. The production of muriate of potash, sulphate of potash, magnesium metal, and hydrochloric acid from Carlsbad ores, leaving only the common salt and dirt from the ore as unused products. Flow sheet and description of process.

1-114. **Postwar Importance of Beneficiated Iron-Bearing Materials.** Charles E. Agnew. *Steel,* v. 115, Sept. 4, '44, pp. 98-100.

Washing and screening of iron ores as well as fine grinding to obtain high-iron concentration followed by sintering are being studied closely by blast furnace operators. Wider use of beneficiated materials in the immediate future may force a change in blast furnace

operation. Factors governing furnace productive capacity with a soft ore burden and a full sinter burden are compared.

1-115. **The Fontana Steel Plant and Its Raw Materials Supply.** George D. Ramsay. *Mining & Metallurgy,* v. 25, Sept. '44, pp. 423-426.

Kaiser Company's completely integrated works near Los Angeles uses ore shipped 175 miles and coal from Utah.

1-116. **Comparison Between the Different Methods of Regulation of Electrically Driven Turbo-Blowers for Steelworks.** *Brown Boveri Review,* v. 30, Nov.-Dec. '43, pp. 328-336.

Defines the regulation requirements of steelworks blowers and indicates the means available for fulfilling these in the case of electrically driven blowers.

1-117. **Applications of the Velox Principle in Mining and Metallurgical Plants.** *Brown Boveri Review,* v. 30, Nov.-Dec. '43, pp. 356-368.

Special design and method of operation of heat exchangers. Object of the Velox principle is the raising of the output and of the efficiency, as well as the increasing of the readiness for service, at the same time reducing considerably the dimensions of the plant and the amount of material required.

1-118. **Basic Electric Melting Procedure for High Quality Alloy Steels.** A. L. Ascik. American Society for Metals. 1944 Preprint No. 26, 25 pp.

Melting problems of high quality alloy steels. Describes the charge, melting and boiling periods, gives a definition of the white and carbide slags, their chemical and physical advantages and disadvantages, and describes the addition of aluminum as harmful to the cleanliness of steel and a high silicon content as very helpful to the surface condition of the ingots. 5 ref.

1-119. **Basic Openhearth as a Producer of Alloy and Special Steels.** C. D. King. *Metal Progress,* v. 46, Sept. '44, pp. 478-480.

Grades of special steels which are now being successfully made in basic openhearth furnaces; prerequisite for the successful production of these high grade steels is that the heats be worked, refined and tapped hot; improvements in refractories have kept step with changes in furnace design and also have contributed to the successful production of alloy steels.

1-120. **Electric Furnace Quality versus Openhearth.** Gilbert Soler. *Metal Progress,* v. 46, Sept. '44, pp. 480-483.

Electric furnace provides certain advantages over the openhearth furnace, which, if utilized, result in a higher quality product; closer chemical analysis limits can be maintained, and greater uniformity of chemistry obtained between various ingots of the heat; grain size, abnormality, and hardenability are more uniform and subject to closer control; cleaner steel can be produced containing less deoxidation products; lower sulphur and phosphorus contents can be obtained; standard practices

can be established and more easily followed, insuring uniform quality from heat to heat.

1-121. **Recovery of Zinc.** A. G. Arend. *Chemical Age,* v. 51, August 5, '44, pp. 131-133.

Procedures with spent copper extraction liquors.

1-122. **Modern Copper Smelting.** W. H. Dennis. *Metal Treatment,* v. 11, Summer '44, pp. 103-111.

Smelting of copper by modern processes shows how the early pioneer work of South Wales, which once held the first place as a copper-producing center, has influenced developments abroad.

1-123. **Postwar Importance of Beneficiated Iron-Bearing Materials.** Charles E. Agnew. *Steel,* v. 115, Sept. 11, '44, pp. 112, 174, 176-177.

Procedures followed in blast furnace practice when stack is burdened with full sinter rather than when soft ore charges are employed. Furnacemen in near future may be compelled to use greater quantities of beneficiated materials in the burden. Ores subjected to beneficiation afford larger production with lower fuel rate and less by-products. 3 ref.

1-124. **The Use of Graphite in the Open Hearth Charge.** John O. Griggs. *Blast Furnace & Steel Plant,* v. 32, Sept. '44, pp. 1065-1067.

Elimination of sulphur; scrap after the war; graphite practice and steel quality.

1-125. **Lithium.** A. G. Arend. *Industrial Chemist,* v. 20, August '44, pp. 423-426.

Extraction, recovery, and industrial uses.

1-126. **Boron in Steel.** R. W. Gurry. *Iron & Steel,* v. 17, Sept. '44, pp. 601-602, 612.

Relative deoxidizing power and elimination in the open-hearth process.

1-127. **Swedish Sponge Iron.** Einer Ameen. *Iron & Steel,* v. 17, Sept. '44, pp. 608-612.

Theory, practice and economics of a direct reduction process.

1-128. **How to Melt Bronze.** A. E. Cartwright. *Foundry,* v. 72, Oct. '44, pp. 85, 216, 218, 220.

Equipment for melting and precautions to observe in practice.

1-129. **Manganese Metal Ready for Large-Scale Production.** James H. Jacobs, John Hunter, and Warren Yarroll. *Engineering & Mining Journal,* v. 145, Oct. '44, pp. 88-91.

Ore reduction; leach conditions; the electrolysis; cell construction; cathode cleaning.

1-130. **First Report on the Basic Cupola by the Melting Furnaces Sub-Committee.** *Foundry Trade Journal,* v. 74, Sept. 21, '44, pp. 55-59.

Basic brick linings; cupola melting of ferro-manganese; desulphurization; experiments in dephosphorization; preliminary melts with pig-iron; dephosphorization of steel scrap, wrought iron and pig-iron charges.

1-131. **Magnesium From Sea Water.** Gerald E. Stedman. *Metals and Alloys,* v. 20, Oct. '44, pp. 941-948.

Engineering, metallurgical and chemical aspects of the process and a description of the Dow-operated Velasco, Texas, plant for carrying it out.

1-132. **Rimming Steel—Experiments on Melts of Rimming-Steel Composition in the Laboratory High-Frequency Furnace.** T. Swinden, W. W. Stevenson, and G. E. Speight. *Engineers' Digest*, v. 1, Sept. '44, pp. 585-586.

The prime difficulty in reproducing ideal rimming conditions in these small ingots by the technique described was the prevention of the rapid growth of the crust of pure metal.

1-133. **Recent Progress in Tin Smelting and Metallurgy.** C. L. Mantell. American Institute of Mining & Metallurgical Engineers Preprint, Oct. '44, 18 pp.

Ores; tin deposits; smelting; metallurgy; stages in smelting; tin smelters. 10 ref.

1-134. **Antimony—Its Metallurgy and Refining in Recent Years.** Chung Yu Wang and Guy C. Riddell. American Institute of Mining & Metallurgical Engineers Preprint, Oct. '44, 16 pp.

Liquation of crude antimony; volatilization roasting for preparation of volatile trioxide; the pigmental trioxide; production of metallic antimony; by-products of antimony smelting; extraction by wet methods; refining of antimony metal; production economies. 14 ref.

1-135. **Modern Plants for Reduction of Quicksilver.** Gordon I. Gould. American Institute of Mining & Metallurgical Engineers Preprint, Oct. '44, 16 pp.

Rotary furnaces; feeding rotary furnaces; firing rotary furnaces; multiple-hearth furnaces; dust-collecting equipment; exhaust fans; condensing systems, settling tanks and stack; control; retorts; concentration before roasting; health hazards; typical installations. 3 ref.

1-136. **Beryllium.** Donald M. Liddell. American Institute of Mining & Metallurgical Engineers Preprint, Oct. '44, 5 pp.

Early metallurgy; electric furnace processes; reduction to metal; commercial processes; Perosa process.

1-137. **Thermal Reduction of Alkaline - Earth - Metal Oxides.** W. J. Kroll. *Light Metals*, v. 7, Oct. '44, pp. 465-466.

The earlier laboratory work which led, ultimately, to the evolution of practical commercial methods for the isolation of the alkaline-earth metals, in particular magnesium, by direct thermal reduction from their oxides. 18 ref.

1-138. **Swedish Sponge Iron.** Einer Ameen. *Iron & Steel*, v. 17, Oct. '44, pp. 637-642.

Theory, practice and economics of a direct reduction process.

1-139. **Republic Builds for D. P. C.** T. J. Ess. *Iron & Steel Engineer*, v. 21, Oct. '44, pp. R-18-R-67.

Geared to produce top quality steel from a wide range of materials, this new plant in Chicago is a fine example of modern steel plant design. Coke plant; blast, electric, and open-hearth furnaces, blooming mill.

1-140. **The Three Kids Mine.** *Mining Congress Journal,* v. 30, Oct. '44, pp. 44-45.

Leaching plant, built for the government by the Manganese Ore Co., employs chemical process not previously attempted on a large scale.

1-141. **Zinc Recovery in the Holden Mill.** *Mining World,* v. 6, Oct. '44, pp. 15-18.

Research devoted to the development of a suitable technique for recovering minute quantities of sphalerite in Holden ore has made Howe Sound's Washington operation third largest zinc producer in the state.

1-142. **Maudina Tungsten.** *Mining World,* v. 6, Oct. '44, pp. 30, 32.

New scheelite project near Oracle, Ariz., is generally regarded as the most significant tungsten development yet in the Southwest.

1-143. **Control of the Acid Open Hearth by Means of Slag Fluidity Test.** G. R. Fitterer. *Iron Age,* v. 154, Oct. 26, '44, pp. 62-64.

A search for the equilibrium which the acid open-hearth reputedly approaches.

1-144. **Induction Furnace for Melting Aluminum.** Manuel Tama. *Mechanical Engineering,* v. 66, Nov. '44, pp. 731-736.

Specific resistivity of molten metals; heat content of molten metals; history of induction furnaces; induction furnaces for melting aluminum; melting of aluminum in foundries; continuous melting and pouring; rolling mills; melting in sand-casting foundries; gas absorption; hard spots; production of hardeners or master alloys.

1-145. **The Constitution of Some Basic Open-Hearth Slags.** Brian Mason. *Blast Furnace & Steel Plant,* v. 32, Nov. '44, pp. 1328-1333.

Examination of thin sections; examination of polished sections; determination of the refractive indices of transparent phases in the finely powdered slag by the immersion method; identification of the phases present by their characteristic lines in an X-ray powder photograph. 6 ref.

1-146. **An Experiment in Making Sponge Iron.** Whitman E. Brown. *Engineering and Mining Journal,* v. 145, Nov. '44, pp. 83-86.

A product of fair grade (about 83% reduced) was made by the Bureau of Mines at the Madaras plant in Texas, but considerable alteration of the equipment would be necessary to determine optimum reduction and costs possible by the method used. The sponge iron was melted without difficulty in an acid electric furnace to make acceptable steel, except for high phosphorus content, which is dependent upon the ore used.

1-147. **New Sintering Plant Affords Close Control of Product.** John D. Knox. *Steel,* v. 115, Nov. 20, '44, pp. 120-121-123, 166.

New unit complete with car dumper, ore storage yard and railroad equipment at Ohio river plant produces 75 tons per hour. Raw materials are handled outside

the sintering building. Auxiliary track hopper and skip provide ample supply of flue dust and coke breeze in bins. Sintering building well ventilated. Dust catchers minimize abrasion.

1-148. **Ore and Coal Handling on the Lower Great Lakes.** A. E. Gibson. *Steel,* v. 115, Nov. 27, '44, pp. 94-96, 98.

How iron ore deposits of the Mesabi range have played a part in the industrial development of the United States.

1-149. **The Electrochemistry of the Dow Magnesium Process.** Ralph M. Hunter. *Canadian Chemistry & Process Industries,* v. 28, Nov. '44, pp. 737-741.

Design and operation of the Dow electrolytic cell for electrolyzing fused magnesium chloride. 8 ref.

1-150. **Hydrometallurgical Treatment of Cobalt Ores.** B. Du Four. *Chemical Age,* v. 51, Nov. 4, '44, pp. 443-444.

Conversion to soluble sulphates.

1-151. **Metallurgy of Liquid Steel.** B. B. Rosenbaum. *Industrial Heating,* v. 11, Dec. '44, pp. 2042, 2044, 2046.

Problems in manufacture of acid open-hearth steel.

1-152. **Smelting of Krivoyrog Lump or Powdered Ore in a Charge Mixture.** Hans Reinfeld. *Stahl und Eisen,* v. 64, April 6, '44, pp. 217-222.

Smelting of iron ore received in large quantities from Krivoyrog (Russia) during the years 1942 and 1943 was found to be very difficult. After a series of investigations described in this article, a method of handling such ore, sizing it, and sintering, showing very satisfactory results was developed.

1-153. **Basic Electric Melting for High Quality Alloy Steels.** A. L. Ascik. *Canadian Metals & Metallurgical Industries,* v. 7, Dec. '44, pp. 26-33.

Steel-making a battle against oxygen. 5 ref.

SECTION II

PROPERTIES OF METALS

2-1. **Diffusion of Indium in Bearings.** A. A. Smith, Jr. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1640, 4 pages (disc. 2 pages).

Depth of diffusion of indium is greatest in the cadmium alloy, followed by lead alloys. With copper and sterling silver the depth of penetration of indium was relatively slight. 8 ref.

2-2. **Diffusion in Relation to Changes in Microstructure.** Marie L. V. Gayler. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1648, 5 pages.

Annealing cast metal and followed by hot-working. Cold working followed by heat-treatment. Diffusion in metals and alloys is a process without which little use could be made of much available material. The rate of diffusion can be accelerated by various well-known methods.

2-3. **Degassing of Metals.** F. J. Norton and A. L. Marshall. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1643, 21 pages.

Apparatus and technique; temperature measurement; preparation of sample; nature of gas evolved at various temperatures; cleaning. Degassing W, Ni, C, Fe. 18 ref.

2-4. **Preface to Diffusion.** Robert F. Mehl. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1658, 10 pages.

Rate of diffusion in liquid or solid metals or thin films; carburizing, decarburizing and nitriding; freezing of alloys; homogenization; diffusion in treatment of metals; electrical and analogue method; application to practical problems. 41 ref.

2-5. **Influences of Gas-Metal Diffusion in Fabricating Processes.** Frederick N. Rhines. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1645, 16 pages.

Nature of gas-metal diffusion; gases in molten metals; degassing of liquid metals; gas evolution in castings; gases in solid metals; hydrogen; surface and subsurface oxidation; oxidation of bi-metals; reduction of contained oxides; alternate oxidation and reduction; N and S. 13 ref.

2-6. **Palladium: Its History and Properties.** L. Sanderson. *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 41-42.

The discovery and development of Pd are reviewed; various processes of extraction are described, and some

of its mechanical and physical properties discussed. Reference is made to some of its applications.

2-7. **Controlled Crystal Growth in Tantalum Ribbons.** Adalbert B. Mrowca. *Journal of Applied Physics,* v. 14, no. 12, Dec. '43, pp. 684-689.

Microscopic examination of surfaces developed in tantalum ribbons on heat treatment in vacuum. Modification of surface structure results due to recrystallization over a temperature range of 1900° K to 2500° K. Grain growth is shown to increase exponentially with the temperature.

2-8. **Thermal Stresses in Ingot Molds.** *Industrial Heating,* v. 11, no. 1, Jan. '44, p. 80.

Stresses in a long circular mold calculated; theory of stresses; molds on non-circular section; end effects; surface stresses calculated from measurement of temperature and expansion of outer mold surface; detailed mathematical analysis of stresses in long circular molds. Abstract of Paper 20/'43, Committee on Heterogeneity of Steel Ingots, Iron & Steel Institute.

2-9. **The Structure and Segregation of Two Ingots of Ingot Iron, One Containing Lead.** L. Northcott. *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 30-32.

Chemical analysis, microstructure, machinability, mechanical properties, and X-ray examination of ingot iron with and without addition of lead. Paper released at autumn meeting of Iron and Steel Institute.

2-10. **Hydrogen and Nitrogen as Causes of Gassiness in Ferrous Castings.** Carl A. Zapffe and Clarence E. Sims. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44, pp. 517-562.

Gassiness in iron and steel is often a function of the hydrogen content and the changes in solubility of hydrogen in metal which take place during solidification. Hydrogen is introduced into the liquid metal by means of carriers, the most common of which is moisture. Bubbles of hydrogen can form only when nucleating centers are present. These are generally supplied by hydrogen-oxygen or other reactions. Austenitic steel is less subject to gassiness and bleeding than ferritic steel. The addition of deoxidizers serves to replace some of the hydrogen which would otherwise act as a deoxidizer, thus tending to increase the concentration of hydrogen gas in the metal. In exceptional cases, gassiness and bleeding may result from the release of nitrogen by unstable nitrides present in the metals. This occurrence may be prevented by the addition of stabilizing elements such as titanium.

2-11. **Indium—the Metal Vitamin.** *Western Metals,* v. 2, Feb. '44, pp. 15-16.

History of development and properties of indium.

2-12. **Effect of Grain Size and Bar Diameter on Creep Rate of Copper at 200° C.** E. R. Parker and C. F. Riisnes. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1690, 8 pages.

Creep tests were conducted on an oxygen-free high-conductivity copper at 200° C. to determine the effect

of grain size on creep rate. Grain sizes ranging from 3 to 1500 grains per. sq. mm. were tested in bars of 0.160, 0.375, and 0.505-in. diameter. The number of grains in the cross section of the test bars varied a thousand-fold. The creep strength was found to be independent of grain size for each bar size. The two larger sizes had equal strength, but the small bars were considerably weaker, particularly at high stresses. The small bars seemed to be oxidized considerably, and their high ratio of surface to volume suggested that oxidation was weakening the bars. 16 ref.

2-13. **Palladium: Some Properties and Uses.** J. C. Chaston. *Metallurgia,* v. 29, Jan., '44, pp. 133-134.

The latest available figures are given for the physical properties of palladium. Particular attention is directed to its capacity for dissolving hydrogen and transmitting it by diffusion. Some of the uses of this metal in pure form or as alloys are briefly discussed.

2-14. **The Fame and Fortune of Magnesium.** *Westinghouse Engineer,* v. 4, March '44, pp. 43-45, 56.

Mg is the number one glamour metal of the day, but it has required two world wars to bring it to a place of importance among the major metals. Now that war's insatiable demands for incendiaries and for airplanes have resulted in a U. S. production capacity of about 300,000 tons annually, and with the enormous improvement in magnesium technology that is resulting, the many alloys of magnesium—the lightest of all metals—will be important as postwar structural materials.

2-15. **On the Density, Thixotropy and Setting of Heterogeneous Silver Amalgams.** Douglas Rennie Hudson. *Metallurgia,* v. 29, Feb. '44, pp. 207-213.

The density of silver amalgams prepared from very pure metals has been determined over the heterogeneous range. Throughout the interval the density varies little from that of pure mercury, approximately 13.6, despite the lower density and smaller atomic volume of silver, and the existence of an inter-metallic compound. These amalgams show reversible thixotropy very perfectly. On standing they "set" spontaneously, from the fluid or plastic state which characterizes them on formation, to a semi-solid relatively hard mass; this hardening is due to the establishment of a reseau of solid phase, in which the mercury is held like water in a sponge. Setting is accompanied by a diminution of 1 to 1½% in density in a few days. 35 ref.

2-16. **The Recovery and Use of Molybdenum and Its Relation to Recent Metallurgical Developments.** T. E. Norman. *Mines Magazine,* v. 34, Feb. '44, pp. 72-77.

History, ore reserves, operations at Climax, the relation of molybdenum to recent metallurgical developments, high strength engineering steels, stress engineering, alloys for elevated temperatures, high speed tool steels, other developments.

2-17. **Activated Alumina.** J. Harwood and W. Cule Davies. *Chemical Age,* v. 50, March 4, '44, pp. 223-228.

Properties and industrial applications.

2-18. **Engineering Applications of Lithium.** James F. Driver. *Machinery (Lloyd)*, v. 16, March 4, '44, pp. 37-40.

Lithium used as a deoxidiser in production of copper castings; addition to cast iron improves the density of the metal and gives better machinability. Fundamental properties of lithium studied.

2-19. **A Brief History of Magnesium in America.** Willard H. Dow. *Metal Progress,* v. 45, April '44, pp. 675-680, 718.

Efforts made to reclaim a chemical by-product and to learn how to alloy, fabricate and use magnesium, one of the war's most necessary munitions.

2-20. **Aluminum for Present and Post-War Products.** *Product Engineering,* v. 15, April '44, pp. 253-268.

A summary of the expanding possibilities of aluminum as affected by wartime production, applications, economic considerations, and experience in the design of strong, light-weight structures.

2-21. **Versatile Indium.** Fred P. Peters. *Scientific American,* v. 170, April '44, pp. 154-156.

Once valued at $20,000 an ounce, indium now sells for $7.50. Its peculiar properties open wide fields of use in high speed bearings, solders, jewelry, and as a hardening element in non-ferrous alloys. Not on the list of critical metals.

2-22. **Will Magnesium Survive the War?** Samuel Crowther III. *Western Metals,* v. 2, May '44, pp. 12, 15-16.

Future possibilities of this miracle metal outlined.

2-23. **Thermal and Electrical Conductivity of Graphite and Carbon at Low Temperatures.** Robert A. Buerschaper. *Journal of Applied Physics,* v. 15, May '44, pp. 452-454.

Theory, experimental arrangement and procedure, results. 2 ref.

2-24. **The Metallurgy of Modern Alloys.** R. H. Harrington. *Steel Processing,* v. 30, May '44, pp. 299-301.

The concept of lattice strain, as the pressure variable for metallic phase systems: Pressure-temperature-concentration planes defining phase systems. Pressure-temperature diagrams for some pure metals. Standard temperature-composition diagram for the copper-tin system.

2-25. **The Action of Water on Lead.** E. A. G. Liddiard and P. E. Bankes. *Journal Society of Chemical Industry,* v. 63, Feb. '44, pp. 39-48.

A critical survey of published information is followed by an account of a study of the action of lead on distilled water containing known quantities of carbon dioxide.

2-26. **Magnesium and Its Alloys.** *Canadian Metals & Metallurgical Industries,* v. 7, May '44, pp. 38, 47.

Production methods, fabrication, deformation characteristics.

2-27. **War's Effect on Wrought Copper Alloys and Their Production.** D. K. Crampton. *Mining & Metallurgy,* v. 25, June '44. pp. 297-300.

Variety decreased—limits of compositions made more realistic—fabrication methods improved.

2-28. **The Substance of and Mechanism in the Volatilization of Tin During Pyro-Metallurgical Processes.** S. M. Baxter. Thesis for D.Sc. Degree, Massachusetts Institute of Technology, 1943.

2-29. **The Application of Radioactive Tracers in the Study of Adsorption and Self-Diffusion in Certain Minerals.** K. C. Vincent. Thesis for D.Sc. Degree, Massachusetts Institute of Technology, 1943.

2-30. **Metals in the Stars.** Harold Spencer Jones. Institute of Metals *Journal*, v. 70, May '44, pp. 175-196.

Spectrographic methods which permit the identification of the metals present in the stars. The elements present in the sun are then discussed, it being emphasized that only the elements in the outer layers of the sun and stars can be determined. The spectrum of the sun's corona, which until recently provided one of the unsolved problems of astronomy, is shown to be due to atoms of Fe, Ni and Ca in states of high ionization.

2-31. **Aluminum in the Chemical Industries.** *Light Metals*, v. 7, June '44, pp. 267, 268, 269-273.

Deals almost exclusively with unalloyed aluminum and the resistance of the metal to corrosion by various inorganic media.

2-32. **Refractory Metals: Their Manufacture and Use.** Claus G. Goetzel. *Mining & Metallurgy*, v. 25, August '44, pp. 373-375.

Tungsten, molybdenum, and tantalum, and their alloys, often in powder form, superior for many high-duty applications.

2-33. **Practical Aspects of Diffusion in Metals.** *Metallurgia*, v. 30, June '44, pp. 73-76.

The degassing of metals; diffusion and microstructure; gas-metal diffusion in fabricating processes; diffusion in alclad steel; diffusion of indium in bearings and in chromizing.

2-34. **Columbium.** *Chemical Age*, v. 51, July 1, '44, p. 17.

Pure metal derived from the oxide.

2-35. **Solubility of Ferrous Oxide in Pure Solid Iron.** *La Technique Moderne*, v. 35, no. 13 and 14, July 1 and 15, '43, p. 110. *Engineers' Digest*, v. 1, August '44, pp. 494-495.

Evidence of the coalescing of FeO inclusions, which is a direct consequence of this solubility.

2-36. **Capillarity of Metallic Surfaces.** E. R. Parker and R. Smoluchowski. American Society for Metals. 1944 Preprint No. 13, 11 pp.

Phenomena observed in brazing and coating operations roughly correlated on the basis of a simple consideration of surface energies and geometrical factors. It is shown that the balance of changes of the solid-liquid, solid-air and liquid-air surface energies depends upon the capillary roughness of the metallic surface. The roughness is approximated by a groove of an angle α inclined to the surface of the metal at an angle β.

2-37. **The Rare Earths.** R. C. Vickery. *Metallurgia,* v. 30, July '44, pp. 130-134.

Present position of the chemistry of the rare earth elements. Their nature summarized and a general account given of methods of separation, identification and determination.

2-38. **Damping Capacity of Metals.** W. H. Hatfield, L. Rotherham, and E. M. A. Harvey. *Iron & Steel,* v. 17, Sept. '44, pp. 613-618.

The effect of air resistance, length of service, temperature changes, reproducibility of tests, variation in alloy contents and mechanical treatment.

2-39. **Aluminum for Beginners.** *Light Metals,* v. 7, Sept. '44, pp. 459-460.

Elementary history and field of application of aluminum.

2-40. **Phosphorus in the Metal Industries.** Frank T. Sisco. *Mining & Metallurgy,* v. 25, Oct. '44, p. 491.

The principal evil of phosphorus is that it causes cold-shortness (brittleness at atmospheric temperature or below) in steels or low-carbon irons made from pig or cast iron containing a considerable percentage of the element.

2-41. **Silver, Lead and Indium.** Urban A. Mullin. *Monthly Review,* v. 31, Oct. '44, pp. 898, 900-903.

Silver, lead and indium make a combination which, to date, has not been excelled for bearings subjected to high speeds and heavy loads.

2-42. **Light Metals Versus Plastics.** Ronald Fleck. *Light Metals,* v. 7, Nov. '44, pp. 518-521.

Relative positions of aluminum alloys and synthetic resins.

SECTION III

PROPERTIES OF ALLOYS

3-1. **High-Silicon Acid-Resisting Cast Iron.** J. E. Hurst. *Foundry Trade Journal,* v. 71, no. 1425, Dec. 9, '43, pp. 283-189. (Also *Iron and Steel,* v. 17, no. 4, Dec. '43, pp. 181-185.)

Corrosion resistance; mechanical and physical properties; effects of carbon, gas content and temperature; annealing and welding.

3-2. **Mechanical Properties of Iron-Phosphorus Alloys.** *Iron and Steel,* v. 17, no. 4, Dec. '43, pp. 192-193.

Carbon-free iron-phosphorus alloys containing 0.12% to 0.86% P made to cold roll. 0.65% P could be rolled with care. 0.86% could not be rolled. Physical properties listed. 3 ref.

3-3. **Strength Properties of Aluminum-Copper-Magnesium Wrought Alloys with About 2% Copper and Various Magnesium and Silicon Content After Cold and Hot Hardening.** K. L. Dreyer and Max Hansen. *Zeitschrift für Metallkunde,* v. 35, no. 7, July, '43, pp. 137-146.

Alloys with different Mg content and small Si content; alloys with high Mg content and different Si additions.

3-4. **High Strength Structural Steels.** G. P. Contractor and S. Visvanathan. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 25-26.

Physical properties of Tiscor Steel.

3-5. **The Constitution of Magnesium-Manganese-Zinc-Aluminum Alloys in the Range 0-5 Per Cent Magnesium, 0-2 Per Cent Manganese, and 0-8 Per Cent Zinc. iv. The Aluminum Alloys in the Range 0-5 Per Cent Magnesium,** C. T. A. Little, G. V. Raynor and W. Hume-Rothery. *Journal,* Institute of Metals, v. 69, Nov. '43, pp. 467-493.

Diagrams and methods of calculation are given by means of which some of the phase-field boundaries in the quaternary system can be deduced. 14 ref.

3-6. **Constitution of Silver-Magnesium Alloys in the Region 0-40 Atomic Per Cent Magnesium.** K. W. Andrews and W. Hume-Rothery. *Journal,* Institute of Metals, v. 69, Nov. '43, pp. 485-493.

Some evidence was obtained for the existence of a super-lattice in the alpha phase in the region of 25 atomic %. Mg in slowly cooled alloys annealed at low temperatures. 14 ref.

3-7. **Lead-Base Bearing Metals.** *Metal Industry,* v. 63, no. 22, Nov. 26, '43, p. 339.

Suitability of lead-base alloys to replace Sn-base alloys as bearing linings.

3-8. **Effects of Precipitation Treatment of Binary-Magnesium-Aluminum Alloys.** F. A. Fox and E. Lardner. *Metal Industry,* v. 63, no. 23, Dec. 3, '43, pp. 363-364.

Mechanical properties of the alloys as affected by the precipitation treatments.

3-9. **Effects of Precipitation Treatment of Binary Magnesium-Aluminum Alloys.** F. A. Fox and E. Lardner. *Metal Industry,* v. 63, no. 22, Nov. 26, '43, pp. 340-342.

Description of main forms of beta precipitation in treatment of binary Mg-Al alloys and the factors influencing rate of precipitation.

3-10. **Effects of Precipitation Treatment of Binary Magnesium-Aluminum Alloys.** F. A. Fox and E. Lardner. *Metal Industry,* v. 63, no. 21, Nov. 19, '43, pp. 322-325.

Metallographic examination of binary Mg-Al alloys in the solution-treated and precipitated state shows that 4 general forms of precipitate are produced. The higher the temperature and the longer the time the coarser is the form of the precipitate, the best mechanical properties being obtained when the precipitate is fine.

3-11. **The Fabrication and Treatment of Nickel and High-Nickel Alloys.** W. A. Mudge. *Canadian Mining & Metallurgical Bulletin,* no. 380, Dec. '43, pp. 506-634.

Ni alloyed with Cu, Si, Cr, Fe, and Mo. Mechanical properties, hot and cold working methods outlined. 20 ref.

3-12. **Leaded Manganese - Molybdenum Steel.** T. Swinden. *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 26-30.

Tests have been carried out on material from a non-leaded and a leaded ingot of Mn-Mo steel in order to determine the effect of Pb (0.19%) on the mechanical properties including the machinability; grain size and hardenability are also compared.

3-13. **Metallurgical Investigations of Some Light Alloy Pistons from German Aircraft.** C. Wilson. *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 33-36.

Composition, mechanical properties, hardness tests, macro- and microstructure.

3-14. **Metallic Materials.** H. W. Gillett. *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 84-92.

Standard procedures inadequate to appraise properties of metals needed in bearings. Various types of bearing materials analyzed. (To be cont.)

3-15. **Note on the Relation Between Hot Tearing and Microporosity Effects in a Magnesium Alloy.** G. Goddard. *Magnesium Review,* v. III, no. 4, July '43, pp. 98-101.

Tests indicate that the Mg-base alloy containing 6% Al, 3% Zn is able to withstand quite considerable stresses while hot without forming tear-cavities.

3-16. **Some Experiments on Additions of Calcium to Reduce Solution-Treatment Times for Magnesium Alloys.** G. Goddard. *Magnesium Review,* v. III, no. 4, July '43, pp. 83-92.

A series of pilot heat-treatments to assess the temperatures of intergranular fusion of two selected alloy types with added Ca varying from zero to approximately 0.6%. Also to ascertain the times for possible single step high-temperature solution treatments, and to examine tensile properties of sand-cast test bars so treated.

3-17. **Effect of Some Elements on Hardenability.** Walter Crafts and John L. Lamont. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1657, 11 pages.

Hardenability multiplying factors for the calculation of ideal critical diameter according to Grossmann's principle for various metals. The consistent manner in which the alloys affect hardenability confirms the validity of Grossmann's method of calculating ideal critical diameter. 6 ref.

3-18. **Effect of Several Variables on the Hardenability of High-Carbon Steels.** E. S. Rowland, J. Welchner, and R. H. Marshall. *Metals Technology,* v. 11, no. 1, Jan. '44, 12 pages.

Effects of time at temperatures from 0 min. to 4 hr. and quenching temperatures from 1450° to 1700° F. on the end-quenched hardenability values were determined from normalized and spheroidized prior structures. 11 ref.

3-19. **Diffusion in Alclad 24S-T Sheet.** F. Keller and R. H. Brown. *Metals Technology,* v. 11, no. 1, Jan. '44, Tech. Pub. 1659, 10 pages.

Very little Cu will reach the surface of Alclad 24S sheet by diffusion when a temperature of 800° F. or lower is used. Any treatments for annealing or aging will not cause a significant amount of diffusion. When material is quenched less rapidly, the amount of diffusion to the surface will be important if it changes the potentials to the point where sufficient electrochemical protection is no longer obtained. 8 ref.

3-20. **Physical Metallurgy of Copper and Copper-Base Alloys.** P. H. Brace. *Electrical Engineering,* v. 63, no. 1, Jan. '44, pp. 11-17.

Illustrations of certain basic metallurgical phenomena determining properties and performance of some of the more specialized alloys with particular reference to the effects at elevated temperatures. 9 ref.

3-21. **Making Beryllium-Copper Behave.** Robert W. Carson. *Metals and Alloys,* v. 18, no. 6, Dec. '43, pp. 1314-1319.

Development in U. S., heat treatment, spring properties, advantages and limitations. 9 ref.

3-22. **The Hardenability of Steel.** A. J. K. Honeyman and J. Glen. *Steel Processing,* v. 29, no. 12, Dec. '43, pp. 629-631.

Calculation of hardenability from heat transfer factor.

3-23. **Improving the Physical Properties of Steel.** *Steel Processing,* v. 30, no. 1, Jan. '44, pp. 33-35.

Effect of a special addition agent on the hardenabil-

ity, tensile properties and impact strength of steel made to specification NE 9440.

3-24. **The Metallurgy of Modern Alloys: Part IIIB. The Role of Strain in Precipitation Reactions in Alloys.** R. H. Harrington. *Steel Processing,* v. 30, no. 1, Jan. '44, pp. 41-44.

The classification of the strain in precipitation hardening; IA—precipitation with thermal elastic and plastic strain from the solution quench preceding the precipitation reheat; IB—hardening with mechanical plastic (cold work) intermediate to the solution quench and the precipitation reheat. 6 ref.

3-25. **Fatigue Strength of Nitrided Surfaces.** *Iron Age,* v. 153, no. 4, Jan. 27, '44, p. 55.

Effects of case hardness, case depth, degree of cleanness, stress concentration and corrosive influence on the fatigue strength of nitrided specimens of chromium-molybdenum steels.

3-26. **The Problem of Reduction of Vibrations by Use of Materials of High Damping Capacity.** Andrew Gemant. *Journal of Applied Physics,* v. 15, no. 1, Jan. '44, pp. 33-42.

The reduction in amplitude of unwanted vibrations of machinery parts through the use of materials of high damping capacity. The problem is to reconcile the requirement for high damping with that for high mechanical quality (strength, fatigue resistance, etc.). Two ways are suggested: (1) the use of a material whose decrement generally is low but rises rapidly as the stress increases; (2) the use of a material whose damping capacity is low but rises to high peaks in certain frequency ranges. It is shown by numerical computation in two instances, namely, turbine blade vibrations and crankshaft oscillations in engines, how the suggested methods would work out in practice. 16 ref.

3-27. **Cartridge Brass—Effects of Chemical Composition.** L. E. Gibbs. *Metal Progress,* v. 45, no. 2, Feb. '44, pp. 265-269.

Desirability of adequate scrap segregation and guarding it from careless contamination. Effects of Al, Sb, As, Bi, Cr, Fe, Pb, Ni, P, and Sn. 7 ref.

3-28. **Rolled Zinc-Titanium Alloys.** E. A. Anderson and P. W. Ramsey. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1687, 9 pages.

Preparation of zinc-titanium alloys. Hot-rolling tests, effect of rolling temperature and conditions on properties, annealing, creep tests and stability of properties on aging of above alloy. 5 ref.

3-29. **Constitution of the System Indium-Zinc.** F. N. Rhines and A. H. Grobe. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1682, 10 pages.

The liquidus, solidus, and solvus curves of the indium-zinc phase diagram have been located. This is a simple eutectiferous system with the eutectic at 2.8% Zn and 143.5° C. The limits of solid solubility lie at 1.2% Zn in indium, and approximately 0.2% In in zinc at the eutectic temperature, and diminish with falling temperature. Suitable metallographic techniques are

described. In compression tests it is found that the true stress sigma corresponding to a standard strain passes through a small maximum at 3.48% Zn, but its value is exceeded in alloys containing 50% and more of zinc. 4 ref.

3-30. **Grain Growth and Recrystallization of 70-30 Cartridge Brass.** R. S. French. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1673, 16 pages.

Effects of prior cold work and temperature and time of anneal upon the recrystallization and grain growth of 70-30 cartridge brass. 14 ref.

3-31. **Effects of Wartime Developments on Future Steels.** *Steel,* v. 114, Feb. 14, '44, pp. 104-108, 136, 138, 140, 142, 145-155.

Wartime developments pertaining to steels along the following lines: Fatigue endurance, heat treatment, castings, welding, alloy evaluation, hardenability, special addition agents, NE steels. 34 references.

3-32. **Development of High Yield Strength in Clad 24S Aluminum Alloy.** Earl R. Weiher. *Iron Age,* v. 153, no. 7, Feb. 17, '44, pp. 64-68.

Four 24S clad aluminum alloy tempers are here discussed, with a description of a precipitation aging process that is sound from a production standpoint. Data on the increase in physical properties of the four tempers are included.

3-33. **The Metallurgy of Modern Alloys.** R. H. Harrington. *Steel Processing,* v. 30, Feb. '44, pp. 101-105.

The role of strain in precipitation reactions in alloys.

3-34. **Aging and the Yield Point in Deep Drawing Steel Sheets.** J. R. Low and M. Gensamer. *Steel Processing,* v. 30, Feb. '44, pp. 92-95, 100.

Treating sheet steel in wet hydrogen at a low temperature results in a deep-drawing steel with a very low yield strength, normal tensile strength, fine grain size, and ductility. Experiments described.

3-35. **Effects of Wartime Developments on Future Steels.** W. P. Eddy. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 22 pp. (Mimeo).

Wartime developments pertaining to steel: discussion of fatigue endurance; heat treatment; castings; welding; alloy evaluation; hardenability; special addition agents; NE Steels. 34 ref.

3-36. **The Structure and Segregation of Two Ingots of Ingot-iron, One Containing Lead.** L. Northcott and D. McLean. *Engineers' Digest,* v. 1, Feb. '44, pp. 147-148.

Description of examination made to determine the segregation in a low-carbon steel ingot containing lead, and the influence of lead upon machinability.

3-37. **Iron-Silicon Alloy of High Initial Permeability.** *Engineer's Digest,* v. 1, Feb. '44, pp. 183.

Purification of materials to achieve high magnetization.

3-38. **Use of NE Types of Alloy Steels to Continue After the War.** Charles M. Parker. *American Machinist,* v. 88, March 2, '44, pp. 83-86.

Wartime experience with lower alloyed compositions

has proved their long range value and economy. Alloying elements conserved, production status of NE steels, five NE steels are most popular, specifications based on composition, new tests balance alloys, changes needed in describing steels, postwar alloy supply will be low.

3-39. **The Internal Mechanics of Cast Iron.** Gustav Meyersberg. *Iron & Steel*, v. 17, Feb., '44, pp. 243-247.

The material is regarded as a high carbon, high tensile steel containing a relatively large volume of graphite—of negligible tensile strength, irregular form and distribution, and conducing to the realization of the detrimental results produced by external forces. These effects are discussed, on the basis of experimental work carried out in Germany prior to the war.

3-40. **Iron Alloy Scaling.** M. J. Day and G. V. Smith. *Iron & Steel*, v. 17, Feb., '44, pp. 255-259.

Heat resistance at various temperatures. 2 ref.

3-41. **Automotive Applications of National Emergency Steels.** T. M. Snyder. *Steel*, v. 114, March 6, '44, pp. 128, 130.

Carburizing properties, Brinell hardness, tensile strength, reduction of area, elongation curves, and hardenability of SAE and NE steels compared.

3-42. **Properties of Killed Bessemer Steel.** E. C. Wright. *Steel*, v. 114, March 6, '44, pp. 126, 162, 164, 166.

Methods of killing, variation in heats, influence of phosphorus, properties of killed steel.

3-43. **The Constitution of Magnesium-Manganese-Zinc-Aluminum Alloys in the Range 0-5% Magnesium, 0.2% Manganese, and 0.8% Zinc.** *Metallurgia*, v. 29, Jan. '44, pp. 147-148.

The equilibrium diagram below 400°C. 4 ref.

3-44. **The Constitution of Silver-Magnesium Alloys in the Region 0-40 Atomic Per Cent Magnesium.** *Metallurgia*, v. 29, Jan. '44, pp. 151-152.

Discussion of the equilibrium diagram of Hansen and Andrews and Hume-Rothery.

3-45. **The Alkali Metals in Alloys.** O. P. Einerl and F. Neurath. *Chemical Age*, v. 50, Feb. 5, '44, pp. 144-147.

A survey of their practical application. 36 ref.

3-46. **Engineering Alloys Containing Calcium.** C. L. Mantell and Charles Hardy. *Metals & Alloys*, v. 19, Feb. '44, pp. 364-367.

Tabulation of engineering alloys containing calcium, giving data on compositions, properties, uses, patents, etc.

3-47. **The Inter-Relation of Age-Hardening and Creep Performance. Part I—The Behaviour in Creep of an Alloy Containing 3% Nickel and Silicon in Copper.** C. H. M. Jenkins, E. H. Bucknall, and E. A. Jenkinson. *Institute of Metals Journal*, v. 2, March 15, '44, pp. 57-79.

Behaviour under creep conditions of a wrought copper alloy containing 2.4% nickel with 0.6% silicon, after different thermal treatments. These bring about aging in the alloy and render possible a comprehensive sur-

vey of its properties in relation to various amounts of either age-hardening or age-softening in the range 15 to 625° C. 7 ref.

3-48. **Nitralloy Steels.** *Automobile Engineer,* v. 34, Feb. '44, pp. 71-72.

A range of tough core alloys for various applications. Properties of Nitralloy steels.

3-49. **Strength of Shafts.** *Automobile Engineer,* v. 34, Feb. '44, p. 68.

Effect of transverse holes, splines and shoulders on torsional fatigue.

3-50. **Influence of Improved Magnetic Alloys on Design Trends of Electrical Instruments.** M. S. Wilson and J. M. Whittenton. *Electrical Engineering,* v. 63, no. 3, March '44, pp. 100-104.

Properties of a new magnetic alloy and comparison of its characteristics with other permanent-magnet materials used in small panel electrical indicating instruments of the permanent-magnet moving-coil type. The use of a new cobalt-molybdenum-iron alloy as a permanent magnet material in an indicating instrument and its influence on design trend.

3-51. **Effect of Stretching Clad 24S Aluminum.** Earl R. Weiher. *Steel,* v. 114, March 27, '44, pp. 107-108.

In heat treating Alclad aluminum alloy for use in aircraft, distortion of the metal takes place as a natural consequence. However, in the process of straightening the material, it also is stretched, thus developing a higher yield strength. By increasing the percentage of stretch beyond that required to straighten the material, the initial loss in strength of structural sections used in compression could be regained with a resultant increase in yield strength.

3-52. **Fatigue Strength Properties of SAE X4130 Tubing.** George Sachs and George Espey. *Iron Age,* v. 153, March 23, '44, pp. 62-67.

Most widely used material for aircraft structures is normalized or stress relieved SAE X4130 tubing. This report on the research project conducted under the sponsorship of the Ohio Seamless Tube Co., Shelby, Ohio, discusses the effect of normalizing and stress relief annealing on the fatigue strength properties of this commercial tubing. 4 ref.

3-53. **Wartime Non-Ferrous Metals.** E. G. Jennings. *Canadian Metals & Metallurgical Industries,* v. 7, March '44, pp. 21-23.

Tin bearing alloys—manganese, silicon and aluminum bronzes.

3-54. **The Effect on the Hardenability of Small Additions of Chromium and Molybdenum to a Grain-Size-Controlled 0.9% Nickel Steel.** W. Steven. *Metallurgia,* v. 29, Feb. '44, pp. 177-180.

Effect of simultaneous additions of Mo and Cr to a particular steel over the range zero to 0.6% of Mo and 0.2 to 0.8% of Cr was determined by the Jominy end-quench method. The grain size of the steel investigated was kept as nearly as possible constant. The results indicate that the hardenability of these steels

does not vary as the quenching temperature is altered from 850 to 880°C. or as the time of soaking at the quenching temperature is increased from 20 to 60 min.

3-55. **Aluminum Alloy Sheet and Strip in Aircraft.** E. G. West. *Metallurgia*, v. 29, Feb. '44, pp. 200-201, 230.

Sheet and strip aluminum alloys play an important part in the design of modern aircraft. In many respects their influence has been revolutionary, especially in the stressed skin wing construction in which the sheet metal not only covers, but adds strength to the structure. The applications of aluminum alloy sheet and strip in aircraft have been greatly facilitated by development in fabrication and in various forms of jointing. Here the author briefly outlines some applications and directs attention to the value of sheet and strip in the post-war years.

3-56. **Comparing Structures in Metals and Plastics.** Leslie P. Dudley. *Engineers' Digest*, v. 1, March '44, pp. 234-236.

Properties of sections composed of laminated 1/16-in. birch veneers in comparison with the properties of equivalent sections in other structural materials. The materials with which the plastic are compared are AZM magnesium alloy, duralumin and a typical mild steel.

3-57. **Gas Turbines.** Thos. Hamilton-Adams. *Iron & Steel*, v. 17, March '44, pp. 284, 294.

Possible alloys for use at temperatures up to 1500°C. and higher.

3-58. **The Strength Properties of Aluminum-Copper-Magnesium Deep-Draw Alloys.** *Light Metal* Age, v. 2, March '44, pp. 10-13, 35-37.

Investigated are the strength properties of aluminum-copper-magnesium deep-drawn alloys containing about 2% copper and varying percentages of magnesium and silicon after exposure to age hardening and tempering.

3-59. **Aging and the Yield Point in Deep Drawing Steel Sheets.** J. R. Low and M. Gensamer. *Steel Processing*, v. 30, March '44, pp. 165-167, 177.

Following changes are observed when low-carbon steel of the grades normally used for deep drawing is annealed in wet hydrogen: The yield point is completely eliminated and the stress for the beginning of plastic deformation is greatly reduced. Both strain-aging and quench-aging are completely eliminated. The carbon and nitrogen contents of rimmed steels so treated are markedly lowered.

3-60. **The Progress of Metallurgy and Its Problems in Aircraft.** V. N. Krivobok. *Metal Progress*, v. 45, April '44, pp. 657-663.

Post-aged aluminum alloys; new alloys; compressive strength, spot welding, formability; ferrous vs. nonferrous alloys. Relative merits of light alloys versus carbon, alloy and stainless steels.

3-61. **Gray Iron—Steel Plus Graphite.** *Metal Progress*, v. 45, April, '44, pp. 703-704, 714.

Formation and functions of graphite in cast iron.

3-62. **On the Strength of Highly Stressed, Dynamically Loaded Bolts and Studs.** J. O. Almen. *SAE Journal,* v. 52, April '44, pp. 151-158.

The strength of dynamically loaded, highly stressed bolts and studs is determined by the man with a wrench. Other considerations, such as design, material, and processing, are of relatively minor importance. The elasticity of bolts and studs should be as great as possible. The bolted members should be as rigid as possible. Loss of dimension of the bolted members is particularly hazardous to the strength of short bolts and studs. No adequate means are available for determining nut tightness except when the elongation of the bolt can be measured.

3-63. **Fracture and Comminution of Brittle Solids.** Eugene F. Poncelet. *Metals Technology,* v. 11, April '44, Tech. Pub. 1684, 20 pp.

Comminution of brittle solids occurs in the following steps: 1. Deformation of the solid to be comminuted by the application of outside forces resulting in tensile stresses. 2. Development of one or more cracks as a direct result of these stresses. 3. Formation of compression and transverse pulses caused by these breaks to travel through the solid. 4. Generation of tension and more transverse pulses by reflection of the compression pulses at the solid's free boundaries, causing offspring cracks to form and progress. 5. Formation of residual particles of smaller and smaller sizes as the process is repeated. 23 ref.

3-64. **Preferred Orientation in Annealed 70-30 Brass Wire.** H. L. Burghoff and J. S. Porter. *Metals Technology,* v. 11, April '44, Tech. Pub. 1688, 11 pp.

The preferred orientation, which may be designated most simply by the fiber axis, (III), decreases in intensity as the semifinal annealing temperature increases, but increases in intensity as the severity of the final reduction by drawing temperature increases. The preferred orientation is accompanied by significant increases in yield strength, tensile strength and modulus of elasticity over the values obtaining in randomly oriented wire of similar grain size. 6 ref.

3-65. **Solubility of Hydrogen in Molten Copper-Tin Alloys.** Michael B. Bever and Carl F. Floe. *Metals Technology,* v. 11, April '44, Tech. Pub. 1703, 11 pp.

Results of an investigation of the solubility of hydrogen in representative compositions of the copper-tin system at temperatures ranging from above the liquidus to 1300°C. and at pressures from less than 50 mm. of mercury to about atmospheric. 17 ref.

3-66. **Factors Affecting Rates of Work-Hardening in Primary Substitutional Solid Solutions.** J. H. Frye and C. P. Sun. *Metals Technology,* v. 11, April '44, Tech. Pub., 1711, 5 pp.

Factors affecting rate of work-hardening pointed out and compared with factors previously shown to affect hardness. A program of research has been suggested, which should further clarify the understanding of hardness and of rate of work-hardening. 8 ref.

3-67. **Hardenability of Some Cast Steels.** J. B. Caine. *American Foundrymen's Association* Preprint No. 44-9, April '44, 15 pp.

Because of the increasing use of heat treated steel castings, hardenability of cast steel has become important. Fundamentals of why steel hardens when quenched, and reasons for the adoption of a new test to measure hardenability discussed. Investigation to determine hardenability of some cast steels, and the correlation of these results with those of wrought steels. Actual results are also checked with those obtained, theoretically, from the chemical analysis. 7 ref.

3-68. **Development and Properties of Sand Cast Aluminum Alloy Having High Strength After Aging Without Previous Heat-Treatment.** Hiram Brown. *American Foundrymen's Association* Preprint No. 44-21, April '44, 15 pp.

Development and properties of a sand cast aluminum-base alloy containing magnesium, zinc, and small amounts of titanium and chromium. This alloy, B-81, has the ability to develop high strength properties on aging without undergoing previous heat treatment. 9 ref.

3-69. **The Effect of Copper in Some NE and Low-Alloy Cast Steels.** C. T. Greenidge, M. C. Udy, and K. Grube, *American Foundrymen's Association* Preprint No. 44-22, April '44, 16 pp.

Copper was added to three low-alloy, 0.30%, cast steels in amounts up to 0.50% and to a fourth steel in amounts up to 1.35%. Steels were tested for hardenability by the end-quench method and for tensile properties and hardness after water-quenching or normalizing followed by tempering. Low temperatûre notched bar toughness was determined on specimens similarly heat treated. Copper had no effect on the temperature required to draw to a specified hardness. Hardenability was mildly increased by copper. 9 ref.

3-70. **Gray Iron as an Engineering Material.** R. G. McElwee. *American Foundrymen's Association* Preprint No. 44-35, April '44, 9 pp.

Tensile strength, hardness, transverse strength, deflection, modulus of rupture, compressive strength, modulus of elasticity, plasticity, sheer strength, fatigue and endurance limit, impact, damping capacity, machinability, wear resistance, heat resistance.

3-71. **Effects of Various Elements on the Mechanical Properties and Dezincification of Manganese Bronze.** Alfred H. Hesse, Edwin T. Myskowski, and Blake M. Loring. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 821-836.

Effect of lead and other elements on manganese bronze has been studied in detail, especially in regard to the changes in mechanical properties and resistance to dezincification that may result from furnace charges of contaminated scrap metal. There appears to be little tendency for lead segregation in a well-made manganese bronze. More lead may be permitted if the copper-zinc ratio and the tin content are care-

fully controlled. Tin appears to be one of the best inhibitors of dezincification. Phosphorus, arsenic and lead are in general effective to a certain extent. Antimony not only decreases ductility seriously but also tends to increase the dezincification.

3-72. **The Effect of Lead on Some Mechanical Properties of Manganese Bronze.** George P. Halliwell. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 837-868.

Test bars, metal used, results and discussion, metal and pouring, tensile strength, ductility, yield strength, hardness, regular manganese bronze, leaded manganese bronze, iron and aluminum content, variation in copper and lead. 7 ref.

3-73. **Why Not a 50:50 Cobalt-Copper Alloy?** Colin G. Fink and J. Laurence Hutton. Electrochemical Society Preprint No. 85-18, 12 pp.

Attempts were made to prepare a workable alloy of equal parts of copper and cobalt by two different methods. Neither of these two methods resulted in a true 50:50 alloy.

3-74. **The Scaling Properties of Steels in Furnace Atmospheres at 1150° C.** A. Preece and R. V. Riley. The Iron and Steel Institute. Advance Copy, 14/1943, March '44, 18 pp.

Rate of oxidation and the character of the oxide formed in furnace atmospheres at 1150° C. were examined for a selection of carbon and alloy steels. An account is given of the important influence of SO_2 and O_2 in the furnace atmosphere in governing the process of oxidation. 3 ref.

3-75. **Effect of Wartime Developments on Future Steels.** W. P. Eddy, Jr. Society of Automotive Engineers *Journal,* v. 52, May '44, pp. 169-182.

Fatigue endurance, heat treatment, castings, welding, alloy evaluation, hardenability as a primary requirement, special addition agents, and NE steels.

3-76. **The Effect of Combined Stresses on the Ductility and Rupture Strength of Magnesium-Alloy Extrusions.** E. G. Thomsen and J. E. Dorn. *Journal of the Aeronautical Sciences,* v. 11, April '44, pp. 125-136.

Data reveal that the materials investigated obey the critical shear stress law for rupture. The rupture stress, however, depends upon the conditions of anisotropy, ductility under combined stresses and work hardening. 27 ref.

3-77. **National Emergency Steels.** Norman E. Woldman and Robert C. Gibbons. *Steel,* v. 114, May 1, '44, pp. 116-118, 150-151.

May prove to be permanent and valuable addition to list of alloy steels, maker of aircraft parts finds in making extensive tests.

3-78. **Modification of Steel Projects by Lead.** *Industrial Chemist,* v. 20, March '44, pp. 138-143.

Effects on machinability and other characteristics. 6 ref.

3-79. **Cast Iron as Construction Material.** E. Piwowarsky. *Engineers' Digest,* v. 1, April '44, pp. 269-272.

Cast iron as a brittle material; rolling of cast iron; reinforced cast iron. 10 ref.

3-80. **A Study of Austenitic Grain Growth in Medium Carbon Steels.** J. H. Whiteley. *Engineers' Digest,* v. 1, April '44, pp. 305-307.

Results obtained suggest that the state and character of the carbide as the critical stage is entered, are among the main determining factors. Ferrite precipitation method adopted for study.

3-81. **Strength of Light Alloy Components.** J. L. Beilschmidt. *Aircraft Engineering,* v. 16, March '44, pp. 76-81.

The relation of stress and strain curves and proof loads to the design requirements of aircraft structural components.

3-82. **At Last—One Alloy Steel.** Metallurgicus. *Metal Progress,* v. 45, May '44, pp. 901-902.

Discussion of article by Harry Brearley concerning restrictions in steel specifications.

3-83. **Thermal Expansion of High-Silicon Cast Iron.** Peter Hidnert and George Dickson. Bureau of Standards *Journal of Research,* v. 32, April '44, pp. 145-149.

Data on the linear thermal expansion of high silicon cast iron containing approximately 14% S; with 3% Mo and without appreciable Mo at various temperatures between 20° and 700° C. Differences between the coefficients of expansion of these high silicon cast irons were found to be slight. Both high silicon cast irons were found to have slightly higher coefficients of expansion than electrolytic iron for temperature ranges between 20° and 300° C., and appreciably higher coefficients for higher temperature ranges. No indication of growth similar to that of ordinary cast iron was observed on heating the high silicon cast iron to 700° C. 6 ref.

3-84. **16:2—The Forgotten Stainless Steel.** Max E. Tatman. *Iron Age,* v. 153, May 11, '44, pp. 70-71, 160.

The 16:2 (Type 431) type of stainless steel has only recently been used extensively in the U. S. This alloy has a definite advantage over regular 18:8 stainless steel from a strength-weight ratio standpoint. This is most important in modern aircraft design, especially in the case of seaplanes.

3-85. **Notched-Bar Tensile Test Characteristics of Heat-Treated Low-Alloy Steels.** G. Sachs, J. D. Lubahn and L. J. Ebert. *Welding Journal,* v. 23, May '44, pp. 247-s-248-s.

Effects of variations in surface conditions at the root of the notch, variations in notch radius, and eccentricity of loading on the results of notched-bar tensile tests on heat-treated low-alloy steels. 5 ref.

3-86. **Internal Mechanics of Cast Iron.** Gustav Meyersberg. *Iron & Steel,* v. 17, April '44, pp. 323-328.

Inherent properties in the light of recent German research. The breaking process in steel: "Parting" strength; process of breaking in cast iron; progress of

cracks; stress peak location; notch factor; ascertaining the notch effect by outside measurements; application to existing experimental determinations; breaking stress; Rudeloff's data. 19 ref.

3-87. **Notes on Magnesium-Alloy Technology.** F. A. Fox. *Engineering,* v. 157, April 7, '44, pp. 278-280.

Choice of casting alloys, wrought alloys, surface protection, machinability, recent research and development work on magnesium alloys, applications.

3-88. **Special Addition Agents.** *Iron & Steel,* v. 17, April '44, p. 312.

Effects on hardenability of ferro-alloys containing boron.

3-89. **The Strength Properties of Aluminum-Copper-Magnesium Deep-Draw Alloys.** *Light Metal Age,* v. 2, May '44, pp. 19-22, 30, 32, 34, 36.

Concluding part of a recent German wartime investigation into an aluminum alloy containing 2% copper and varying percentages of magnesium and silicon after exposure to age hardening and tempering. Tests were conducted at the research laboratory of one of the largest light metal plants in Germany—Duerener Metal Works in Berlin.

3-90. **Steel Mixes and Inoculants in Grey Cast Iron.** W. Barnes and C. W. Hicks. Institute of British Foundrymen, Advance Copy, Paper No. 796, 41st Annual Meeting, June 10, '44, 15 pp.

Purpose of the investigation was to measure the effect on physical properties of increasing percentages of steel with and without a measured amount of various inoculants, to measure the effect of a fixed percentage of steel and varying amounts of inoculants and to ascertain the effect of increasing percentages of steel on the reaction of the resultant iron to low temperature treatment and to oil quenching.

3-91. **Compositions of Emergency Steels are Modified.** *Steel,* v. 114, May 29, '44, p. 61.

Changes designed primarily to permit greater consumption of nickel-chromium-molybdenum scrap. New series added.

3-92. **Factors in the Development and Selection of High Temperature Alloys for Dynamic Loading.** C. T. Evans. *Iron Age,* v. 153, June 1, '44, pp. 38-41.

The jet airplane and the newer gas turbines are built on the metals of the turbosupercharger. What these metals are and how they are being developed, and the problems involved in heavily loaded alloys in service for long periods of time at very high temperature.

3-93. **Bronze Marches On.** *Tin & Its Uses,* No. 15, March '44, pp. 6-8.

Technique for the manufacture of 88/10/2 alloy which develops the full physical qualities specified while reducing the tin content from 10% to 7½%.

3-94. **Tin and Antimony in Lead Alloys.** W. R. Lewis. *Tin & Its Uses,* No. 15, March '44, pp. 13-14.

Percentage composition and versatility of alloys.

3-95. **Carbon and Alloy Steels for War Purposes.** *Metallurgia*, v. 29, April '44, pp. 310-312.

A review of recent schedules and specifications.

3-96. **Non-Ferrous Alloys for War Purposes.** *Metallurgia*, v. 29, April '44, pp. 326-328.

Review of recent schedules and specifications.

3-97. **Development of Armor Plate.** *Metal Treatment*, v. 11, Spring '44, pp. 55-58.

Early history. Nickel steel armor, Harvey armor, Krupp armor, ballistic types, class B armor, armor bolts, light armor.

3-98. **The Influence of Diameter upon the Properties of Steel Cable.** W. Püngel, E. Gerold and A. Beidermühle. (*Zeit. Ver. Deut. Ing.*, v. 87, Aug. 7, 1943, pp. 493-497.) *Engineers' Digest*, v. 1, May '44, pp. 356-358.

The influence of cable diameter upon ultimate tensile strength for different diameters of the cable sheave; tests with the same cables were also conducted.

3-99. **Wear-Resistant Castings Cut Maintenance Cost.** Robert McIntosh. *Engineering & Mining Journal*, v. 145, May '44, pp. 76-78.

To increase the abrasion resistance and the resultant life of parts of equipment that are subject to wear, nickel-chromium white iron was used in castings. Analysis of the material used is within that established for Ni-Hard.

3-100. **Failure of Spherical Hydrogen Storage Tank.** A. L. Brown and J. B. Smith. *Mechanical Engineering*, v. 66, June '44, pp. 392-397.

Character of rapid progressive failure was due chiefly to the brittleness, under the conditions existing at the time, of the steel plates from which the sphere was constructed.

3-101. **Cause and Control of Surface Damage.** E. L. Hemingway. *Machine Tool Blue Book*, v. 40, June, '44, pp. 245-246, 248, 250, 252, 254, 256.

Modern view is that molecular attraction is responsible for the greater part of metallic friction.

3-102. **Preferred Orientation, Anisotropy and Earing Behavior of Rolled Brass.** F. H. Wilson. Thesis, Yale University, June 1944.

Integrated X-ray diffraction tests, special tensile and compressive property tests and drawn cup contours of brass sheet are correlated.

3-103. **Hot Hardness Characteristics of High Speed Steels.** R. A. Desilets. Thesis for M.Sc. Degree, Massachusetts Institute of Technology, 1943.

3-104. **Titanium Bronze.** G. P. Swift. Thesis for D.Sc. Degree, Massachusetts Institute of Technology, 1944.

3-105. **The Effect of Boron in Steel.** Robert Barnhart Corbett. Thesis for Ph.D. Degree, University of Pittsburgh, June 1944.

3-106. **Development and Application of Military and Special Steels for Ordnance Purposes.** John H. Frye. *Blast Furnace & Steel Plant*, v. 32, June '44, pp. 695-697.

Ordnance items curtailed, metallurgical developments and improvements.

3-107. **Liquidus Determinations in Zinc-Rich Alloys (Zn-Fe; Zn-Cu; Zn-Mn).** Gerald Edmunds. *Metals Technology,* v. 11, June '44, T. P. 1686, 14 pp.

Technique for the accurate determination of liquidus points in zinc alloys has been described. This involves bringing a partly molten, partly solid alloy to equilibrium and removing and analyzing a sample of the melt. By use of a special sealed container, alloys that are volatile or reactive with the atmosphere have been included for investigation. 8 ref.

3-108. **Influence of Hydrogen on Mechanical Properties of Some Low Carbon Manganese-Iron Alloys and on Hadfield Manganese Steel.** Herbert H. Uhlig. *Metals Technology,* v. 11, June '44, T.P. 1701, 19 pp.

Preparation of alloys and test specimens, effect of furnace atmosphere on ductility of 14% manganese alloy, effect of hydrogen on reduction of area and other properties, effect of tempering, tensile strengths of low carbon alloys, discussion of results. The 6% manganese composition, the 21.5% manganese composition, effect of time and temperature on recovery of ductility, effect of dissolved hydrogen on Hadfield manganese steels, effect of cathodic hydrogen, theory for the cathodic hydrogen results. 14 ref.

3-109. **Physical Properties of a 65 Cu, 10 Mn, 25 Zn Alloy.** J. R. Long and T. R. Graham. *Metals Technology,* v. 11, June '44, T.P. 1705, 16 pp.

The alloy reported here along with several other ferrous and non-ferrous alloys, as possible cartridge-case material, was chosen after a review of the properties of the ternary alloys of copper-manganese zinc. 6 ref.

3-110. **The Present Status of Electrolytic Manganese and Its Alloys.** R. S. Dean. *Metals Technology,* v. 11, June '44, T.P. 1721, 17 pp.

Practice at Boulder City, quality of product, production of electrolytic manganese, ore reserves available for manufacture of electrolytic manganese, present uses of electrolytic manganese, behavior of copper-manganese alloys at low temperatures, direction of possible future development of ferrous alloys. 8 ref.

3-111. **Gray Iron — Steel Plus Graphite.** J. T. MacKenzie. *Metals Technology,* v. 11, June '44, T.P. 1741, 25 pp.

Henry Marion Howe Memorial Lecture. Gray iron is high Si steel with flakes of graphite. Formation of graphite, effect of graphite on mechanical properties of gray cast iron, useful functions of graphite. Models of graphite whorls show them as petals.

3-112. **Endurance of Iron Alloys.** *Chemical Age,* v. 50, May 6, '44, pp. 439-440.

Improvements by addition of metals.

3-113. **The Examination of a Rimming-Steel Ingot Containing 0.29% of Carbon.** T. Swinden. Iron & Steel Advance Copy, April '44, 6 pp.

A 2½-ton ingot of rimming steel containing 0.29% of carbon was examined with particular reference to carbon distribution. There were significant differences in the behavior of this steel as compared with low-

carbon rimming steel during solidification, but nevertheless the heterogeneity was of the same general character. The rim contained about 0.25% of carbon, and, in answer to previous suggestions on the point, it is submitted that this could not have been deposited as primary crystals of delta-iron.

3-114. **Engineering and Application of Magnesium Alloy Castings. I.** David Basch. *Aluminum & Magnesium,* v. 1, Dec. '44, pp. 15-19.

Modulus of elasticity and shear; wear and friction; sparking characteristics; fire hazard; health hazard; magnetic properties; effect of temperature; growth and distortion; creep; fatigue; and shock resistance.

3-115. **Austenitic Valve Steels.** *Automobile Engineer,* v. 34, May '44, p. 193.

Effect of nitrogen on the properties of these alloys.

3-116. **The Metallurgy of Modern Alloys.** R. H. Harrington. *Steel Processing,* v. 30, June '44, pp. 364-365, 392.

A possible concept of strain as the pressure variable relative to alloy phase diagrams; the pressure-temperature composition diagram for cold-rolled tin bronzes.

3-117. **Notes on Magnesium Alloy in Design.** R. O. Brittan. *Automotive Industries,* v. 90, June 15, '44, 26-29.

Mechanical properties of magnesium for general design work.

3-118. **Metallurgy of the Gray Iron Matrix.** R. J. Hafsten. *Iron Age,* v. 153, June 22, '44, pp. 48-51.

If gray iron is looked upon as being a graphitic steel, its metallurgy becomes less of a mystery. Observations from S-curves, influence of alloys. 13 ref.

3-119. **Hardenability of Cast Steel—Symposium.** *Metals & Alloys,* v. 19, June '44, pp. 1415-1424.

Introduction, by C. W. Briggs; Hardenability of cast steel and wrought, by J. B. Caine; Use of the end-quench test for cast steel, by E. J. Wellauer; Hardenability of some cast steels, by Frank Kiper; 1 ref.

3-120. **Data on Springback of Metals.** Robert E. Oestreich. *Aero Digest,* v. 45, June 15, '44, pp. 77-81, 138.

Data accurate for die makers, tensile elements analyzed.

3-121. **Creep Properties of Steels Utilized in High-Pressure and High-Temperature Superheater and Steam Pipe Practice. Part I: Carbon Steels.** H. J. Tapsell. Institution of Mechanical Engineers *Proceedings,* No. 1, '44, pp. 54-62.

Creep properties of carbon steels used in superheater headers, superheater tubes, and steam pipes for service at temperatures up to about 480°C. Object was to obtain data for the estimation of the stress-temperature relationships for specific creep strains of 0.1 to 0.5% to occur in 100,000 hr., and these have been obtained with sufficient precision to warrant their acceptance for practical purposes.

3-122. **Available Beryllium in Copper.** H. G. Williams. *Metal Progress,* v. 46, July '44, pp. 79-81.

Beryllium-copper having the required analysis may fail to develop expected properties. Beryllium present

but not "available" for hardening is often responsible for this trouble, as well as for certain difficulties encountered in fabrication.

3-123. **Strong, Fine Wire; Non-Magnetic.** Herbert H. Uhlig and John J. Naughton. *Metal Progress*, v. 46, July '44, pp. 82-83.

Non-magnetic wires of difficult-to-draw Hadfield manganese steel can be produced by carburizing the easier drawn, low carbon manganese-iron alloy. Gas-phase carburization, followed by homogenization at 1000° C., required only 4 min. for 20-mil wire. The resulting wire contained about 1% carbon and was completely austenitic.

3-124. **Effects of Wartime Developments on Future Steels.** W. P. Eddy. *Machine Design*, v. 16, July '44, pp. 127-132, 162, 164.

Summary on following wartime developments: Fatigue endurance, heat treatment, castings, welding, alloy evaluation, hardenability, special addition agents, and NE steels. Predictions (guesses) made as to how future practices with respect to steels will be affected. 20 ref.

3-125. **Boron in NE 9440 and SAE 4640 Steel.** G. F. Comstock. *Iron Age*, v. 154, July 13, '44, pp. 48-53.

Economy possible in the substitution of boron for Ni, Mo or Cr in the heat treated forging steels, NE 9440 and SAE 4640. The substitution gives equal or better hardenability; and tensile, impact or machinability properties show no difference. Tempering temperature may require some adjustment, especially when Mo is omitted.

3-126. **Copper-Covered Steel Wire at Radio Frequencies.** B. R. Teare and E. R. Schatz. Institute of Radio Engineers *Proceedings*, v. 32, July '44, pp. 397-403.

At radio frequencies the current in copper-covered steel is confined to the Cu portion alone. The resistance and internal inductance are as low as for solid Cu wire of the same outer diameter. ¾ of the Cu that would be required for a solid Cu conductor can be saved by using Cu-covered steel. 7 ref.

3-127. **Effect of Notching on Strained Metals.** G. Sachs and J. Lubahn. *Welding Journal*, v. 23, June '44, pp. 272-s-279-s.

The experimental evidence of notches as they affect the behavior of metals in static tension. 29 ref.

3-128. **Strains in Riveted Joints.** J. A. Chamberlain. *Aero Digest*, v. 46, July 1, '44, pp. 101-102.

Little data on oversize rivet holes and stressed rivets available, and the effect these two conditions have upon the strength of joints. Tests are to evaluate these two adverse conditions.

3-129. **Isothermal Treatments of Some Precipitation Hardening Alloys.** *Industrial Heating*, v. 11, July '44, pp. 1088-1090.

Effects of some "isothermal treatments" upon the mechanical properties. Three industrial alloys were studied: (1) 97% Cu, 2.6% Co, 0.4% Be; (2) 96% Al, 4% Cu, and (3) 92.7% Al, 7% Si, 0.3% Mg.

3-130. **Hydrogen Content and "Flaking" of Acid Open Hearth Steel: II.** B. B. Rosenbaum. *Industrial Heating,* v. 11, July '44, pp. 1110-1114.

"Flaking" in alloy steels with reference to conjectural reasons for its occurrence, and discussions of whether hydrogen alone is the source for this trouble.

3-131. **A Study of a Shell-Steel Ingot.** D. Binnie. Iron & Steel Institute, Advance Copy, Feb. '44, 19 pp.

An ingot of shell steel, teemed uphill, and containing 0.47% of C and 0.88% of Mn. Information given on the manufacture of the steel. The sulphur print and analyses shown. White spots of precipitated ferrite are seen in all sections of the ingot except the feeder head. Lower half of the ingot had, on sulphur printing, a zoned effect: A light colored zone at the surface, a dark zone, a light colored zone and again the normal dark zone of the ingot. This zoning is compared with the acid-etched surface of the metal. Detailed analysis of the steel given.

3-132. **Hardenability.** W. Steven. *Iron & Steel,* v. 17, May 18, '44, pp. 430-432.

Effect of small additions of Cr and Mo to a grain-size-controlled 0.9% Ni steel.

3-133. **Shell Steel.** D. Binnie. *Iron & Steel,* v. 17, May 18, '44, pp. 451-458.

Study of the heterogeneity of a three-ton ingot.

3-134. **Bursting Tests on Notched Alloy Steel Tubing.** G. Sachs and J. D. Lubahn. *Welding Journal,* v. 23, July '44, pp. 351-356s.

Test procedure; bursting tests on notched and unnotched tubing; tubing provided with a double notch; tubular specimens machined from rod.

3-135. **Alloys of Thorium with Copper, Silver and Gold.** E. Raub and M. Engel. *Zeit. Elektrochemie und Angewande Physik. Chemie,* v. 49, no. 12, Dec. '43, pp. 479-486.

Phase diagrams of Th-Cu, Th-Ag and Th-Au. Specific properties of thorium alloys need more investigation for determination of these properties. In all three systems, two different combinations were observed with atomic ratio 3:1 and 5:3.

3-136. **Notes on Recent Trends and Uses of Alloy Steels.** B. B. Morton. *Mechanical Engineering,* v. 66, August '44, pp. 543-546.

Improvement of mechanical properties; heat treated alloys; fatigue; alloys for improvement of physical properties; alloys to resist corrosives.

3-137. **Car Axle Failures Traced to Absorption of Bearing Metal.** Frederick H. Williams. *Product Engineering,* v. 15, August '44, pp. 505-508.

Color photomicrographs reveal that railway car axles with journal-and-brass type bearings absorb Cu at temperatures produced by a "hot-box," thus causing embrittlement and often failure. Investigation based on earlier findings in the field of soldered and brazed joints in which weakening resulted from absorption of non-ferrous metals.

3-138. **Brasses, A.S.T.M. No. B36-43T, Alloys 1 to 8; B134-42T, Alloys 1 to 8; B135-43T, Alloys 1 to 5 (Materials Work Sheet).** *Machine Design*, v. 16, August '44, pp. 149-153.

Properties; physical constants; characteristics; applications; fabrication.

3-139. **Influence of Alloying Elements in Cr-Ni-Mo Steel.** *Iron Age*, v. 154, August 3, '44, pp. 65-67.

Data to show the influence of alloying elements on mechanical properties of a chrome-nickel-molybdenum steel, corresponding to the American SAE X4340 grade.

3-140. **Influence of the Metallurgical Treatment on the Durability of Ingot Molds.** Bela Koros. *Stahl und Eisen*, v. 64, no. 10, March 9, '44, pp. 159-164.

Influence on the durability of steel ingot molds. Determination of the most appropriate composition. Influence of the individual elements on the durability. Influence of heat treatment. The guiding analysis.

3-141. **The Influence of the Tempering Temperature on the Strength Properties of Molybdenum-Free Steel.** Alfred Krisch. *Stahl und Eisen*, v. 64, no. 7, Feb. 17, '44, pp. 105-110.

Investigation on 1¼ and 2¼-in. diameter rods of two plain steels with 0.43% C and 0.56% C, and 6 alloy steels with 0.16 to 0.50% C, 0.2 to 1.6% Si, 0.5 to 2.2% Mn, 0 to 2.5% Cr and 0 to 0.21% V, quenching in water or oil, and tempering at different temperatures, as to hardness, tensile strength, yield strength at 0.2 offset, ductility and notched impact, on the edge, core, and cross section of the test specimens. Grain size and Jominy hardenability data that should be supplied in order to rationalize the results are lacking.

3-142. **Impact Strength of Cast Steel.** Eugen Piwowarsky and Alfons Evers. *Stahl und Eisen*, v. 64, no. 9, March '44, pp. 142-144.

The effects of annealing time and temperature on basic O. H., basic electric, and O. H. and acid bessemer cast steels on impact behavior over a range of temperature from +385° F. to —20° F, were studied on plain carbon, on 0.12 to 0.50% Cr, and on 0.20 to 0.55 Cr, 0.23 to 0.31% Mo cast steels. Results for room temperature impact for each of the 12 steels are shown in solid diagrams for annealing times of ½, 1¾ and 4½ hr. at 1510, 1560, 1620 and 1670° F. Seven of the steels ran 0.28 to 0.32% C, the others 0.36 to 0.41% C. Phosphorus was about 0.065 in the acid O. H., 0.06 in the basic electric, 0.085 in the Bessemer and low in the basic O. H. Conclusions are drawn as to impact vs. method of melting, which need to be viewed in the light of the carbon and phosphorus contents. No information is given as to whether the heats were or were not aluminum treated, and grain size data are lacking. The behavior is what would be expected from the composition and treatment, irrespective of the method of melting. The tensile properties corresponding to the impact properties are not given.

3-143. **The Strength of Glued Sheet Metal.** N. A. De Bruyne. *Iron Age*, v. 154, August 24, '44, pp. 60-63.

Types of joints, possible strengths, and various design characteristics.

3-144. **Precipitation from Supersaturated Solid Solutions.** H. K. Hardy. *Light Metals,* v. 7, July '44, pp. 328-336, 337-348, 349.

A critical survey of the readily available information dealing with structural and property changes accompanying precipitation and with the effect of various factors on the rate of precipitation and the magnitude of the property changes undergone. 209 ref.

3-145. **Bimetal Performance at 800 F.** P. R. Lee. *Metals & Alloys,* v. 20, August '44, pp. 346-349.

A test method and results for bimetal at 800° F. Effect on service performance of manufacturing methods, prior heat treatment and internal and external stresses.

3-146. **Factors Affecting Ingot Product Surface.** H. F. Lesso. *Iron & Steel Engineer,* v. 21, August '44, pp. 63-73.

Evaluations of some of the many factors which influence the surface of semi-finished steel.

3-147. **Wood or Metal?** *Aero Research Tech. Notes,* no. 19, July '44, pp. 1-6. *Engineers' Digest,* v. 1, August '44, pp. 517-519.

Tension; compression; the structure loading coefficient; advantages of composite structures.

3-148. **High Strength Alloy with Natural Re-Aging Properties.** Hiram Brown. *Aeronautical Engineering Review,* v. 3, August '44, pp. 65, 67, 69.

Commercial use of a high strength, natural aging aluminum alloy should be of outstanding interest to the aircraft industry, since intricate parts must be made free from warpage, distortion, or cracks. Advantages: (1) Severe stresses, caused by quenching, which are likely to cause cracking avoided. (2) Warpage due to high temperature and subsequent straightening operations avoided. (3) Expensive heat treating equipment to handle large castings unnecessary. (4) Production delays due to fitting heat treatment to foundry production are not encountered. 7 ref.

3-149. **Modern Views on Alloys and Their Possible Application.** W. Hume-Rothery. Institute of Metals *Journal,* v. 70, June '44, pp. 229-273.

Cohesion rises to a maximum in the region of groups VI and VII. General effect of size factor and electron concentration on the formation of solid solutions is described. It is shown that two kinds of lattice distortion have to be considered, one due to the valency electrons, and the other to the electron clouds of the ions. The effect of this on the solubilities of some elements in solid copper is indicated. Characteristics of the theory of magnesium alloys and aluminum alloys also discussed.

3-150. **Beryllium Copper in Instrument Design.** L. B. Hunt. *Journal of Scientific Instruments,* v. 21, June '44, pp. 97-105.

Physical characteristics of beryllium copper with particular reference to elastic properties. Usefulness of

this alloy for instrument springs and similar parts is shown to be in its combination of high elastic limit with relatively low elastic modulus. Technique required for the fabrication and heat treatment of beryllium copper. 16 ref.

3-151. **Improving the Impact Stress Endurance of a Carburized Gun-Part.** K. B. Valentine. *Metal Progress*, v. 46, Sept. '44, pp. 467-472.

A hammer for an automatic gun was giving service failures from fatigue after about 5000 rounds. Tests are outlined showing how heat treatment, shot peening, and surface protection affected the endurance.

3-152. **The Copper-Manganese Equilibrium System.** R. S. Dean, J. R. Long, T. R. Graham, E. V. Potter, and E. T. Hayes. American Society for Metals. 1944 Preprint No. 9, 21 pp.

Study of the transition temperatures in pure electrolytic manganese confirms the existence of three points, alpha-beta, beta-gamma, and gamma-delta. Examination of copper-manganese alloys by thermal analysis, X-ray diffraction and metallographic methods established a copper-manganese equilibrium diagram differing from previously published diagrams by (A) the transition point in pure manganese, (B) position of the solidus, (C) extent of the gamma-beta field, and (D) placement of the alpha-gamma phase boundary. 25 ref.

3-153. **Properties of Transitional Structures in Copper-Manganese Alloys.** R. S. Dean, E. V. Potter, and J. R. Long. American Society for Metals. 1944 Preprint No. 10, 16 pp.

Single-phase tetragonal structures and high damping capacities found in furnace-cooled alloys are considered to result from strained lattice conditions in the initial stages of the decomposition. Anomalies in the resistivity and temperature coefficient of resistance are traced to the presence of epsilon. 8 ref.

3-154. **Age Hardening Copper-Manganese-Nickel Alloys.** R. S. Dean, J. R. Long, T. R. Graham, and C. W. Matthews. American Society for Metals. 1944 Preprint No. 11, 22 pp.

Hardenable copper-manganese-nickel alloys containing 22 to 24% manganese and equal amounts of nickel are shown to have the ability to harden to Rockwell C-45 and higher. Hardness may be controlled by regulation of aging times. Material hardened from the cold-worked condition responds more rapidly than the simple solution treated material. The physical properties of the alloy compare quite favorably with those of copper-beryllium alloys. The alloy made with electrolytic manganese has greater elongation at all hardness levels.

3-155. **The Effect of Carbon Content on Hardenability.** E. S. Rowland, J. Welchner, R. G. Hill, and J. J. Russ. American Society for Metals. 1944 Preprint No. 16, 27 pp.

End-quench hardenability determinations were conducted on S.A.E. 52XX and S.A.E. 46XX, with carbon ranging in 0.20% increments from approximately 0.20

to over 1.00%. Data are presented on the effect of carbon content on hardenability for the various conditions considered. The practical aspects of these results as affecting commercial heat treatments are evaluated and discussed. 6 ref.

3-156. **The Partition of Molybdenum in Steel and Its Relation to Hardenability.** Fred E. Bowman. American Society for Metals. 1944 Preprint No. 18, 14 pp.

Molybdenum segregates to the carbide when the isothermal transformation takes place at temperatures of 1200 and 1100° F. An explanation for the increased hardenability produced in steels by molybdenum is offered on the basis of the effect of this segregation and altered carbide structure on nucleation rates. The alpha iron lattice parameter versus molybdenum content relationship is extended to the room temperature solid solubility limit (6% molybdenum). 14 ref.

3-157. **The Rate of Diffusion of Molybdenum in Austenite and in Ferrite.** John L. Ham. American Society for Metals. 1944 Preprint No. 19, 26 pp.

Coefficients of diffusion of molybdenum in pure austenite and ferritic iron-molybdenum alloys and in pure austenitic iron-molybdenum-carbon alloys. Composite nature of the diffusion coefficients of binary substitutional solid solutions discussed and diffusion and partition data used as the basis for an explanation of the effect of molybdenum on the shape of the S-curve.

3-158. **New Developments in High Strength Aluminum Alloy Products.** E. H. Dix, Jr., American Society for Metals. 1944 Preprint No. 20, 20 pp.

High compressive yield strengths obtained in products of three artificially aged aluminum alloys—24S-T8, 14S-T and 75S-T. Mechanical properties, yield strength and extrusions studied. 12 ref.

3-159. **The Properties of Aluminum Alloys Melted in an Induction Heated Crucible Furnace.** James W. Poynter. American Society for Metals. 1944 Preprint No. 22, 10 pp.

Physical properties of cast and heat treated test bars of aluminum alloys were determined. The metal from which these bars were cast was melted in a clay graphite crucible heated by induced high frequency electric currents. No fluxing treatment was used. The properties obtained were in excess of the minimum values required by the specifications.

3-160. **Magnesium Sheet.** P. T. Stroup, G. F. Sager, and J. B. West. American Society for Metals. 1944 Preprint No. 23, 28 pp.

Relation of mechanical properties of magnesium sheet to aluminum content, zinc content, and cold work. Improved resistance to corrosion was shown to result from a decrease in iron content. Stress corrosion cracking was overcome by means of magclad sheet. Forming and joining operations described. 30 ref.

3-161. **A Comparison of Aluminum and Titanium Deoxidation for Preventing Strain Aging Embrittlement in Low Carbon Steel.** George F. Comstock and John R. Lewis. American Society for Metals. 1944 Preprint No. 24, 14 pp.

Strain aging of low carbon steel, melted in an induction furnace and forged from small ingots; reports the results as affected by differences in forging practice and heat treatment as well as by different deoxidation. Methods of testing were (1) the work brittleness method, (2) impact tests after tensile straining, with and without aging, and (3) Brinell hardness tests at increasing temperatures up to 500° F.

3-162. **The Ar′ Reaction in Some Iron-Cobalt-Tungsten Alloys and the Same Modified With Chromium.** W. P. Sykes. American Society for Metals. 1944 Preprint No. 25, 11 pp.

The ternary alloys of iron, cobalt, and tungsten exhibit a behavior similar to that of the steels as regards the eutectoidal decomposition, $\gamma = \alpha + \epsilon$. Chromium delays the onset of the reaction and appears to depress the position of the three phase field in which γ is stable. 3 ref.

3-163. **Chromium Steels of Low Carbon Content.** Russell Franks. American Society for Metals. 1944 Preprint No. 33, 22 pp.

Results of tests made on low carbon steels containing up to about 25% chromium. Wrought 3% chromium steels containing up to about 0.10% carbon are at least five times as resistant to atmospheric corrosion in industrial atmospheres as ordinary low-carbon steel.

3-164. **Characteristics and Properties of Some Cast Chromium-Molybdenum Steels.** N. A. Ziegler and W. L. Meinhart. American Society for Metals. 1944 Preprint No. 34, 39 pp.

5.0 to 9.0% chromium, 0.5 to 1.0% molybdenum steels commonly used in castings for corrosion and elevated temperature service are noted for their thermal sluggishness, which makes them susceptible to cracking during welding and heat treatment. Results of thermal analysis, metallographic examination, physical property determination, and welding experiments. 88 ref.

3-165. **Segregation of Molybdenum in Phosphorus-Bearing Alloyed Gray Cast Iron.** F. B. Rote and W. P. Wood. American Society for Metals. 1944 Preprint No. 35, 24 pp.

Phosphorus shown to be soluble in the particular irons studied to the extent of about 0.12%. Acicular microstructure is changed to a pearlitic structure as the phosphorus is increased sufficiently above the solubility limit. Segregation of molybdenum takes place on cooling from the iron-iron carbide eutectic to the iron-iron phosphide eutectic.

3-166. **Factors Controlling Graphitization of Carbon Steels at Subcritical Temperatures.** Charles R. Austin and M. C. Fetzer. American Society for Metals. 1944 Preprint No. 42, 46 pp.

Effects of mechanical treatment and thermal treatment above the critical, prior to subcritical graphitization; develops the role of environment on the progress of graphite formation. Role of subcritical graphite nucleation and of atmosphere also received experimental consideration. Results lend strong support to the sug-

gested role of aluminum (calcium and silicon) oxide in promoting subcritical graphitization, when present in suitable form and suitable degree of dispersion. 7 ref.

3-167. **Precipitation From Supersaturated Solid Solutions.** H. K. Hardy. *Light Metals,* v. 7, August '44, pp. 383-409.

Age-hardening of aluminum alloys. 16 ref.

3-168. **Future Steels.** W. P. Eddy. *Iron and Steel,* v. 17, July '44, pp. 541-545.

Effect of wartime developments on specifications and uses.

3-169. **Variable Heat Flow in Steel.** R. Jackson, R. J. Sarjant, J. B. Wagstaff, N. R. Eyres, D. R. Hartree, and J. Ingham. Iron and Steel Institute, Advance Copy, July '44, 57 pp.

Methods for the calculation of variable heat flow have been devised which take into account the variable diffusivity of the material, latent heat of a change point and almost any surface conditions. Calculations made for the case of a steel ingot cooling in a mold also allowed for the radiative heat transfer across the air gap between ingot and mold and the different thermal properties of the two materials. The range of problems dealt with has been limited by the lack of adequate information on the thermal properties of steel. Two instruments, one mechanical and the other electrical, have been used for the calculation as well as numerical methods. 8 ref.

3-170. **Chemical and Mechanical Properties of Some of the National Emergency Steels.** William C. Stewart and Richard E. Wiley. *Journal* American Society of Naval Engineers, v. 56, August '44, pp. 396-411.

National Emergency Steels of the 8000 series offer much promise as alternate materials for forgings. These steels are well adapted for heat treatment by normalizing and tempering. Steels NE 9445 and 9450 failed to meet either AN or HG requirements when normalized and tempered at 1200° F. None of the samples showed any excessive amounts of non-metallic inclusions. Likewise, no flakes or cracks were encountered in the forgings. The average endurance ratio (ratio of endurance limit to tensile strength) for the 20 steels tested in rotating flexure is 0.43. This is somewhat lower than would be expected for alloy steels, and in this respect the steels are intermediate between carbon and alloy steels. The NE steels of this series are inferior to available high temperature bolting materials.

3-171. **Factors Influencing Wear in Machines.** D. Landau. *Machine Design,* v. 16, Sept. '44 pp. 105-108.

Surface melting. Ideal combination to resist galling; fretting starts with slip; 15 ref.

3-172. **Effect of a High Antimony Content in the Tin Used in Making Bronze Alloys.** Charles A. Reichelderfer. Bruce W. Gonser, and J. M. Blalock. American Foundrymen's Association *Transactions,* v. 52, Sep. '44, pp. 232-247.

Lower grade tin, containing less than 1.5% antimony (such as Texas Tin Smelter Alloy Metal) can be used in

bronze alloys without harmful influence on the physical properties.

3-173. **Hair-Line Cracks in Steel.** D. Cathcart. *Metal Treatment,* v. 11, Summer '44, pp. 112-116, 111.

General position relating to hair-line cracks and dents in turn with methods of detection, the effect of hydrogen, steel composition, cooling stresses, steel making, etc., on the formation of these cracks, and finally the methods available for preventing the presence of these cracks in the final worked and heat treated product. 6 ref.

3-174. **Liquid Solubility of Manganese in Magnesium.** N. Tiner. American Institute of Mining and Metallurgical Engineers. Preprint, Oct. '44, 6 pp.

The liquid solubility of manganese in magnesium is limited and depends on temperature and the amount of other alloying elements present; diagram of Ruhrmann as reported by Schmidt erroneous; the solic solubility of manganese in magnesium at the freezing point is less than 2.3% and the X-ray measurements of Schmidt and Siebel are incorrect, or the alloys show a peritectic reaction. 8 ref.

3-175. **The Effect of Time and Temperature on the Relief of Residual Stress in Low Alloy Steels.** Paul C. Cunnick and J. K. McDowell. American Welding Society Preprint, Oct. '44.

Information on the effect of time and temperature on the relief of residual stresses in high tensile, low alloy constructional steels.

3-176. **The Removal of Gases from Molten Bronzes.** W. A. Baker and F. C. Child. Institute of Metals *Journal,* v. 70, August '44, pp. 349-371.

Tin bronzes are subject to gas unsoundness arising in particular from solution and evolution of hydrogen, and to a lesser extent from water vapor, carbon monoxide, and sulphur dioxide. In the absence of elements with a high affinity for oxygen, which form comparatively insoluble oxides, hydrogen may be eliminated by oxidation of the melt, followed by deoxidation to remove the excess of oxygen added. Commercial bronzes such as are used for sand castings generally contain considerable amounts of phosphorus and/or zinc which hinder the removal of hydrogen by oxidation. Hydrogen can be readily removed by scavenging treatments with inert gases and/or by the addition to the charge of substances which evolve inert gases during melting. 2 ref.

3-177. **The Effect of Shrinkage and Gas Porosity on the Pressure Tightness and Mechanical Properties of Bronze Sand Castings.** W. A. Baker, F. C. Child, and W. H. Glaisher. Institute of Metals *Journal,* v. 70, August '44, pp. 373-406.

Tin-bronze castings are liable to contain small interdrendritic and intercrystalline cavities which cause leakage under pressure and mechanical weakness. The cavities are primarily due to freezing shrinkage, which is not easily fed owing to the long freezing ranges of

the alloys. Practical recommendations. Importance of selecting the correct alloy for the purpose required, and particularly the value of leaded gun-metals for intricate castings required to be pressure tight, is stressed. 2 ref.

3-178. **The Influence of Melting Conditions on the Physical Properties of Steel Castings.** H. T. Protheroe. Iron and Steel Institute Advance Copy, August '44, 23 pp.

Report on the mechanical test results obtained from a number of cast steels from various sources. Critical examination of the data recorded during manufacture and used in conjunction with mechanical test results in an attempt to trace the factors having the most pronounced influence on the quality of cast steel. Combined phosphorus and sulphur percentage affects the mechanical properties to a much greater extent than do other factors. Unsoundness also has a pronounced effect. Casting temperature, under controlled conditions, may have a slight effect. Microstructure of the cast steels does not differ appreciably.

3-179. **Future Steels.** W. P. Eddy. *Iron & Steel,* v. 17, August '44, pp. 566-569.

Effect of wartime developments on specifications and uses.

3-180. **The Torsional Impact Strength of Tool Steels.** R. Scherer and H. Kiessler. *Stahl und Eisen,* v. 63, '43, pp. 353-357. *Alloy Metals Review,* v. 3, March '44, p. 1.

Studies of the effect of tempering on the toughness and torsional impact strength at temperatures up to 350° for carbon and carbon-chromium steels and up to 650° for high speed steels show that performance depends upon hardness, linear expansion and magnetic properties. Optimum heat treatments are given.

3-181. **The Developments of Substitute Heat-Resisting Cast Steels for Low Temperature Service.** R. Schinn and R. v. Tinti. *Stahl und Eisen,* v. 63, '43, pp. 125-133, 151-153. *Alloy Metals Review,* v. 3, March '44, p. 1.

Complete mechanical properties at room and elevated temperatures resulting from different heat treatments, hot brittleness and weldability of plain and alloyed cast steels, containing C.0.1 to 0.42, Si 0.2 to 1.4, Mn 0.3 to 1.9, Cr 0 to 2, Mo 0 to 0.63 and V 0 to 0.48% were determined. High Cr and Cr-Mn steels were hot-brittle. Cr-V steels containing more than 0.28% C tended to develop cracks on welding. Welded areas had poorer mechanical properties than the parent metal. The effect of alloying elements, and additions of Ti and Cb, on heat treatment and properties is discussed.

3-182. **Making and Study of a Special Ni-Mn-Mo Electric Cast Steel.** Jean Cournot. *Rev. Metal.,* v. 39, '42, pp. 61-64. *Alloy Metals Review,* v. 3, March '44, p. 1.

Melting log, casting practice and mechanical properties of the finished steel containing C 0.28 to 0.33, Ni 1.8 to 2.1, Mn 1.0 to 1.2, Mo 0.15 to 0.35 and Si 0.25 to 0.40% are given. After quenching from 875° in oil or normalizing from 875°, both followed by 1 hr. drawing at 600°, quenched steel has 115,000 tensile strength,

85,000 yield point, and 13% elongation; normalized steel has 100,000 tensile strength, 78,000 yield point and 18% elongation in 2 in.

3-183. **The Effect of Carbide-Forming Elements on the Elastic Limit of Steel at Room Temperature.** K. Dies. *Archiv fur Eisenhuttenwessen,* v. 16, '43, pp. 333-340. *Alloy Metals Review,* v. 3, March '44, p. 2.

The effects of Ti, V, Cr and Mo on the elastic limit of steel samples in various stages of heat treatment were investigated. After cooling in the furnace from 930°, the elastic limit disappears with the complete binding of carbon to carbide. The transition from the one type of flow limit to the other takes place gradually in Cr and Mo steels and abruptly in Ti and V steels. After cooling in air, conditions in titanium steels are similar to those after furnace cooling, but the vanadium steel still shows after complete binding of the carbon an unstable flow curve in a certain alloying range; from this it can be concluded that vanadium carbide, like iron carbide, can produce a pronounced flow limit. Tempering experiments show that for the elastic limit, the chemical nature of the carbides is less of a determining factor than their distribution.

3-184. **The Effect of Small Additions on the Crystallization and Physical Properties of Some Special Alloys.** V. S. Mes'kin and Yu M. Margolin. *Stal.* no. 5, '41, pp. 47-53. *Chem. Zentr.* no. 2, '42, p. 1284. *Alloy Metals Review,* v. 3, March '44, p. 2.

In heat resisting Cr-Al alloys having high electrical resistance, small additions of vanadium and fireclay retard grain growth at high operating temperatures. Small additions of Ti, Ta and V to 14% Cr stainless steel increase resistance to corrosion by sea water and boiling HNO_3 solutions and also improve the mechanical properties. Small additions of Ti and V to Permaloy affect primary crystallization and the magnetic properties, the initial permeability being more than double while the coercive force is decreased one-third.

3-185. **Specifications for Lead, Tin, and Zinc Alloys.** *Metallurgia,* v. 30, August '44, pp. 184-186.

With the object of rationalizing the whole field of non-ferrous metals and alloys, Services Schedule B.S./S.T.A. 7 was prepared. In view of its magnitude, copper and its alloys were dealt with in 1942, an additional section covering nickel and its alloys in 1943, while the present review concerns three further sections which have been added covering specifications for lead, tin and zinc and their alloys.

3-186. **The American National Emergency Steels.** Roger F. Mather. *Metallurgia,* v. 30, August '44, pp. 197-201.

Detailed account of the development of the American National Emergency steels and includes the recent revised list of NE steel compositions. Various aspects of the subject are discussed covering raw materials, steelmaking and application.

3-187. **Nickel Bronze Castings.** Ely Portman. *Metals & Alloys,* v. 20, Sept. '44, pp. 620-624.

Production practice for relatively hard-to-handle

nickel bronze castings that permits their economical production, with properties well within specification limits. 2 ref.

3-188. **Strong Cast Aluminum Alloy, Requiring no Heat Treatment.** Albert J. Matter. *Metals & Alloys,* v. 20, Sept. '44, pp. 643-644.

The engineering properties and some service test results of "OH38" aluminum alloy.

3-189. **Fundamental Principles Involved in Segregation in Alloy Castings.** R. M. Brick. *Metals Technology,* v. 11, Sept. '44, pp. 3-12.

Coring; gravity segregation; normal and inverse segregation. 10 ref.

3-190. **A Review of Factors Underlying Segregation in Steel Ingots.** B. M. Larsen. *Metals Technology,* v. 11, Sept. '44, pp. 13-34.

Undercooling and nuclei formation; temperature gradients and heat dissipation during freezing; directional growth of crystals; selective freezing and diffusion; dendrite formation; grain size, orientation in outer ingot zones; settling of free-floating dendrites—volume change in freezing; effects of liquid motion and stirring caused by gas evolution; freezing of typical rimmed ingot; transition series of ingot structures with decreasing gas evolution; hydrogen evolution during solidification; segregation of oxygen and non-metallics. 4 ref.

3-191. **The Relation of Open-Hearth Practice to Segregation in Rimmed Steel.** J. W. Halley and G. L. Plimpton. *Metals Technology,* v. 11, Sept. '44, pp. 37-57.

Mechanisms producing segregation; effect of practice on segregation; temperature and mold practice; examples of segregation in rimmed ingots. 11 ref.

3-192. **Segregation in a Large Alloy-Steel Ingot.** S. W. Poole and J. A. Rosa. *Metals Technology,* v. 11, Sept. '44, pp. 58-72.

Determining the distribution of chemical elements within a large, killed alloy steel ingot, by sulphur printing and quantitative chemical analysis. 4 ref.

3-193. **Segregation in Babbitt.** T. E. Eagan and W. R. McCrackin. *Metals Technology,* v. 11, Sept. '44, pp. 73-88.

Experimental procedure; casting of babbitt; effect of cooling rate; effect of stirring babbitt during freezing; addition of small amounts of metal; segregation in crystal size and orientation control in centrifugally cast bearings.

3-194. **Inconel, Wrought and Cast, Materials Work Sheet.** *Machine Design,* v. 16, Oct. '44, pp. 113-116.

Properties; physical constants; characteristics; applications; fabrication; corrosion resistance; galvanic corrosion; annealing.

3-195. **Effects of Precipitation Treatment of Magnesium-Aluminum Alloys.** F. A. Fox and E. Lardner. *Engineering,* v. 158, Sept. 15, '44, pp. 218-220.

The metallography of the precipitate; ascertaining whether any one particular form is to be desired or is to be avoided from the point of view of its influence

on the mechanical properties of a typical commercial alloy.

3-196. **The Physical Properties of High Carbon Steel Rope Wire as Affected by Variations in Patenting.** H. J. Godfrey. *Wire & Wire Products,* v. 19, Oct. '44, pp. 635-642.

Nature and deviation of the physical properties of cold drawn wire due to variations in the heat treatment of the patented wire.

3-197. **Permanent Magnets.** Werner Jellinghaus, *Iron & Steel,* v. 17, Sept. '44, pp. 597-600.

Quinternary alloys of Fe, Ni, Al, Co and Cu with preferred magnetic orientation.

3-198. **Effects of Precipitation Treatment of Magnesium-Aluminum Alloys.** F. A. Fox and E. Lardner. *Engineering,* v. 158, Sept. 22, '44, pp. 238-240.

The precipitation of beta phase from the supersaturated solution of aluminum in magnesium; mechanical properties.

3-199. **75S — Alcoa's New High-Strength Aluminum Alloy.** J. A. Nock. *Metals and Alloys,* v. 20, Oct. '44, pp. 922-925.

The complete engineering story of the nature, properties, workability and applications.

3-200. **R 301—Reynolds' New High Strength Aluminum Alloy.** T. L. Fritzlen and L. F. Mondolfo. *Metals and Alloys,* v. 20, Oct. '44, pp. 926-933.

Its general attributes are those of a high strength, light weight material with corrosion resistance comparable to that of pure aluminum but with mechanical properties superior to those of conventional pure-aluminum-clad metals. It is also easy to fabricate, can be heat treated, and introduces no contamination in the usual scrap-handling systems.

3-201. **The Magnetization of Polycrystalline Iron and Iron-Silicon Alloys.** G. C. Richer. Iron & Steel Institute, Advance Copy, Sept. '44, 50 pp.

New survey of the competency of the domain theory. Conclusion is that the basic theory can provide reliable guidance for industrial effort but inherently significant disharmonies between theory and observation are common to laboratory single crystals and to commercial polycrystalline aggregates. New method of analysis of the technical magnetization curve. 35 ref.

3-202. **Properties of Aluminum Alloys Melted in Induction Heated Crucible Furnace.** James W. Poynter. *Aluminum and Magnesium,* v. 1, Dec. '44, pp. 20-21, 27-28.

Physical properties of aluminum casting alloys melted in a crucible furnace heated by induced high frequency electric currents were determined and compared with the properties of the same alloys melted in gas-fired crucible furnaces. (Paper read at 26th Annual Convention of American Society for Metals.)

3-203. **Recovery of Cold-worked Aluminum Iron as Detected by Changes in Magnetic Properties.** J. K. Stanley. American Institute of Mining and Metallurgical Engineers Technical Publication no. 1767, 10 pp.

How strains are relieved in aluminum iron at low temperatures. How cold working and strain relief might shed some light on what takes place in the deformation of metals. 19 ref.

3-204. **Special Cast Brasses as a Substitute Material.** E. Pelzel and R. Hanel. *Metall-Wirtschaft,* nos. 27-29, August 20, '43, pp. 383-393.

Series of strong brasses described. Comparative investigation of the properties of these alloys. Possibility of the improvement of such alloys by the addition of iron, nickel, and manganese emphasized. The alloys described are a cross between brass and the aluminum bronze family with a total Al+Fe+Ni+Mn of 3%.

3-205. **Static Strength, Elongation, and Brinell Hardness of Porous "Silumin Gamma" Sand-Cast Parts.** H. Reininger. *Metall-Wirtschaft,* nos. 27-29, August 20, '43, pp. 394-400.

The production of sand-cast parts of "Silumin" or other light-metal alloys without gas porosity is not always possible. Gas-porosity is in no way connected with penetrability of liquids or gases, and only the strength, elongation, and Brinell hardness of such material should be the criterion of its qualities. Experimental evidence is adduced to support this view.

3-206. **Grain Size and Properties of Sand-cast Magnesium Alloys.** R. S. Busk and C. W. Phillips. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1771, 11 pp.

Data giving the relationship between grain size and mechanical properties. Data also included on the combined effects of grain size and microporosity. Discussion of factors influencing the grain size of sand castings included. 9 ref.

3-207. **Creep Data on Die-Cast Zinc Alloy.** E. H. Kelton and B. D. Grissinger. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1774, 6 pp.

Final data on well-known zinc die-casting alloys and means of applying these data to engineering design. 2 ref.

3-208. **Creep Properties of Cold-Drawn Annealed Monel and Inconel.** B. B. Betty, H. L. Eiselstein and F. P. Huston. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1775, 12 pp.

Accumulated data on two solid solution alloys, cold-drawn, annealed Monel and cold-drawn, annealed Inconel. 5 ref.

3-209. **Creep Characteristics of a Phosphorized Copper.** H. L. Burghoff an A. I. Blank. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1777, 19 pp.

Creep characteristics of a deoxidized copper of low residual phosphorus content. 10 ref.

3-210. **The Effects of Notches of Varying Depth on the Strength of Heat Treated Low Alloy Steels.** George Sachs, J. D. Lubahn and L. J. Ebert. American Society for Metals 1944 Preprint no. 15, 25 pp.

The combined effects of notch depth and notch radius on the tensile strength of a low alloy steel, heat treated to various strength levels between 145,000 and 240,000 psi. were found to be considerably different from previously observed effects. The effect of notch depth on the notch strength ratio can be represented by a single family of curves, the same curve applying to a sharply notched steel of rather low strength and to a high strength steel, provided with a well-rounded-off notch. 11 ref.

3-211. **Distribution of Carbon Between Titanium and Iron in Steels.** W. P. Fishel and Brison Robertson. *Metal Technology,* v. 11, Oct. '44, T. P. 1763, 4 pp.

The distribution of carbon between titanium and iron studied by measuring the relative amounts of iron carbide and titanium carbide present in a series of annealed steels in which the ratio of titanium to carbon extended from 0.527 to 4.61. 5 ref.

3-212. **The Hardness of Silver-Antimony Solid Solutions.** R. M. Treco and J. H. Frye, Jr. *Metals Technology,* v. 11, Oct. '44. T. P. 1769, 6 pp.

The relation between hardness and concentration in the silver-antimony system from very dilute to nearly saturated solutions of antimony in silver. 8 ref.

3-213. **Substitute Solders of the 15-85 Tin-lead Type.** J. B. Russell and J. O. Mack. *Metals Technology,* v. 11, Oct. '44. T. P. 1770, 16 pp.

Investigation to develop an alloy containing a maximum of 15% tin, with no cadmium or bismuth, having solder properties equivalent to or better than those of substitute solders now specified containing 18 to 20% tin or even approaching the properties of the standard 40 to 60 tin-lead solder. 25 ref.

3-214. **Magnetic Materials.** F. Brailsford. *Electronic Engineering,* v. 17, Oct. '44, pp. 192-195.

The magnetization process.

3-215. **Mechanical Properties of Case-Hardened Materials.** S. L. Gertsman and I. H. MacPherson. *Canadian Metals & Metallurgical Industries,* v. 7, Oct. '44, pp. 32-33.

Tensile strength and ductility of case determined from "case break point."

3-216. **Properties and Uses of Aluminum and Magnesium Base Die Castings.** J. C. Fox. *Aluminum & Magnesium,* v. 1, Oct. '44, pp. 28-29, 44-45.

Outstanding characteristics of aluminum die castings. The consumption of aluminum die castings has changed places with zinc alloy die castings, which were more than twice the consumption of aluminum before the war. Die casting alloys; silicon-aluminum alloy; copper-silicon type alloy; magnesium-aluminum type alloy; magnesium base alloy die castings; chemical composition; stability. 1 ref.

3-217. **The Effect of Nickel and Iron on the Properties of a Wrought Aluminum - Copper - Magnesium Alloy.** Maurice Cook and R. Chadwick. Institute of Metals *Journal,* v. 70, Sept. '44, pp. 423-433.

Small additions of either element delayed age hardening, and the maximum hardness after full aging decreased to an extent which depended upon the total iron plus nickel content, although when this exceeded about 1% further additions of either element were without effect. 3 ref.

3-218. **Some Observations on the Mode of Occurrence of Selenium, Tellurium, and Bismuth in Copper.** R. Eborall. Institute of Metals *Journal*, v. 70, Sept. '44, pp. 435-446.

Solid solubility of selenium and tellurium in phosphorus-deoxidized copper; the partial system Cu_2Se-Cu_2Te; X-ray examination of residues; modes of occurrence of bismuth; thermal analysis; microscopic examination. 15 ref.

3-219. **Shot Peening and the Fatigue of Metals.** H. F. Moore. *Iron Age*, v. 154, Nov. 2, '44, pp. 67-71, 136, 138, 140, 142.

Limitations of the process in offsetting various forms of structural damage. Explains the theory of shot peening and then proceeds to interpret test data. 9 ref.

3-220. **Some Useful Wartime Developments in Whiteheart Malleable Iron.** G. R. Webster. *Foundry Trade Journal*, v. 74, Oct. 12, '44, pp. 109-114.

The wearing properties and resistance to heavy loads of whiteheart malleable cast iron can be greatly improved by suitable hardening and, in some cases, a subsequent simple tempering operation.

3-221. **The Magnetisation of Polycrystalline Iron and Iron-Silicon Alloys.** G. C. Richer. Iron & Steel Institute Advance Copy, Sept. '44, 50 pp.

Survey of the competency of the domain theory to account for the observed characteristics of such material. Basic theory can provide reliable guidance for industrial effort but inherently significant disharmonies between theory and observation are common to laboratory single crystals and to commercial polycrystalline aggregates. A new method of analysis of the technical magnetisation curve.

3-222. **Electron Diffraction Patterns of Copper-Gold Alloy.** F. E. Haworth. *Bell Laboratories Record*, v. 22, Nov. '44, pp. 596-600.

Heating metallic alloys under controlled conditions to improve their properties.

3-223. **Effect of Grain Size and Subzero Treatment on Productivity of Four High-Speed Steels.** S. M. DePoy. American Society of Mechanical Engineers *Transactions*, v. 66, Nov. '44, pp. 645-648.

Results show that the grain size, carbide solution, and type of martensite formed in the tool have a very marked effect on its cutting ability. It appears that subzero treatment is much more effective, when large grain sizes are developed. 2 ref.

3-224. **Machinability of Plain-Carbon, Alloy, and Austenitic (Nonmagnetic) Steels, and Its Relation to Yield-Stress Ratios When Tensile Strengths Are Similar.** E. J. Janitzky. American Society of Mechanical Engineers *Transactions*, v. 66, Nov. '44, pp. 649-652.

It is possible by the use of yield-stress ratios of plain carbon, alloy, and austenitic (non-magnetic) steels of the same tensile strength to obtain an index of machinability for rough-turning. The relation between Taylor speed and yield-stress ratios of the same tensile strength is expressed mathematically.

3-225. **Effect of Shot Peening on Fatigue Strength.** H. F. Moore. *Machine Design,* v. 16, Nov. '44, pp. 145-150.

How shot peening strengthens (or, if unskillfully done, may weaken) a metal under repeated stress. Certain types of structural damage which may be done to structural and machine parts described. 10 ref.

3-226. **Fatigue Resistance of NE Steel Shafts.** O. J. Horger and T. V. Buckwalter. *Iron Age,* v. 154, Nov. 16, '44, pp. 60-63.

One of the drawbacks in the use of NE steels for highly stressed machine parts has been the lack of adequate data on their fatigue resistance. Described herein are the tests made on NE 8949, NE 8744 and NE 9445 steels as compared to SAE 4340. Endurance limit ratings are given these steels for various degrees of stress concentration.

3-227. **Properties of Metals and Alloys at Sub-Zero Temperatures.** J. W. Donaldson. *Metal Treatment,* v. 11, Autumn '44, pp. 161-170.

Mechanical properties of metals at sub-zero temperatures. 16 ref.

3-228. **The Effect of Elements on the Mechanical Properties of Chromium-Molybdenum Steel EI-84.** V. M. Doronin. *Stal,* 1943, no. 1/2, pp. 39-41. *Alloy Metals Review,* v. 3, June '44, p. 1.

Experiments are reported on steels containing C 0.35 to 0.45%, Cr 0.60 to 0.90%, Ni 1.25 to 1.75%, Mo 0.15 to 0.25%, Si 0.17 to 0.37%, Mn 0.40 to 0.80%, P not more than 0.030% and S not more than 0.030%, oil hardened from 850° and annealed at 580 to 640°, then air cooled. C and Si increase the hardness of steel but decrease its toughness. This confirms some previously published results. Cr, Ni and Mn seem to have the same effect, but further studies disprove this. The tendency to develop annealing brittleness increases with increasing amounts of Cr, Ni and Mn; the annealing brittleness can be overcome by hastening the cooling after annealing. Heat resistance of these steels is affected by the following elements in decreasing order: P, C, Mo, Si, Cr, Ni. The effect of C is 40 times that of Ni, 6 times that of Mo and approximately 20 times that of Cr and Si. These steels should be annealed at 570 to 640°, the exact temperature depending on the carbon content and corrected for the other elements (graphs and table). These steels can be replaced by a steel containing Ni less than 0.50%, Mn 0.70 to 1.10%, Cr 0.75 to 1.05%, P less than 0.040% and S less than 0.04%, which can be made in open-hearth furnaces. It should be oil hardened from 830 to 900°, annealed at the proper temperature and cooled in oil or water.

3-229. **Production of Flakeless Structural High-Alloyed Steel.** A. A. Rastorguey and I. G. Arzamastsev, *Stal,* v. 3,

no. 9/10, 1943, pp. 47–54. *Alloy Metals Review*, v. 3, June '44, p. 2.

It was observed in a large number of instances that flakes developed in steel even though the cooling period was long. The flakes developed after a considerable time and therefore passed the control testing. This condition occurred quite frequently in varieties of steels made in open hearths which formerly were made in electric furnaces. The purpose of this investigation was to work out a method of cooling and annealing after rolling which would insure a flakeless steel and at the same time shorten the process. Both pearlitic and martensitic steels were investigated. To attain the two mentioned aims steels having a pearlitic transformation should be cooled slowly to somewhat below Ar. Steels having martensitic transformations should be treated similarly to below Ar''. In either case, immediately after the cooling, the steel should be annealed. For martensitic steel cooled in soaking pits or gravel beds and then annealed in furnaces, 6 hr. may elapse between the two operations. In plants having furnaces for direct treating of steel, the latter is placed in such furnaces, kept at a temperature below Ar or Ar'' and kept there long enough for the steel to go through the respective point. The steel is then transferred into a chamber kept at the annealing temperature, kept therein for the requisite time and then discharged into the air.

3-230. **The Effect of Steam Used for Atomising Liquid Fuel on the Formation of Flakes in Alloy Steel.** G. F. Mikheev. *Teoriya Prakt. Met.* 1940, no. 11–12, 9–10; *Khim. Referat. Zhur.*, v. 4, no. 7–8, 1941, p. 87. *Alloy Metals Review*, v. 3, June '44, p. 2.

The production of flakes in Cr-Ni steel containing C 0.2, Cr 1.0 and Ni 2.7% and in Cr-Mo steel containing Cr 1.15 and Mo 0.3% was studied. The flakes may be caused by the steam used for atomizing liquid fuel in the basic open-hearth furnace. Replacing the steam with air only during the boiling process did not prevent the formation of flakes. Changing the burners to air atomization facilitated the disappearance of flakes.

3-231. **Cr-Mn-Ti and Si-Mn-Mo Structural Steel Trademarked 40KhGT and 40SGM.** M. P. Braun. *Stal*, v. 3, no. 9/10, 1943, pp. 88–90. *Alloy Metals Review*, v. 3, June '44, p. 2.

The compositions of the two steels are C 0.40, 0.44; Si 0.36, 1.71; Mn 0.79, 1.24; Cr 1.73, 0.17; Ni 0.21, 0.22; Mo 0, 0.33; Ti 0.052, 0; S 0.025, 0.028; P 0.032, 0.039 respectively. The physical and mechanical properties of the steels are given.

3-232. **Cr-Si-Mn-Mo Steel as Substitute for Highly Alloyed Cr-Ni-W Steels.** M. P. Braun. *Stal*, no. 1–2, 1943, pp. 61–63. *Alloy Metals Review*, v. 3, June '44, p. 2.

A steel containing C 0.34, Si 1.05, Mn 6.93, Cr 16.25 and Mo 0.33% was investigated as substitute for Cr-Ni steels containing W and Mo. Tested at 900° the new steel compared well with Cr-Ni-W-Mo steels. Optimum results are obtained when the steel is oil hardened from

1100° to 1050°. It can be worked mechanically in a satisfactory manner after air hardening from 1000°. The coefficient of expansion in the interval 700 to 900° changes insignificantly. Photomicrographs, physical properties, etc., are given.

3-233. **Hardenability and Interchangeability of Cast Steels.** H. A. Schwartz. *Iron Age*, v. 154, Nov. 23, '44, pp. 42-46.

Equality of hardenability does not insure accurate or reliable predications as to other physical properties of cast steels. Basing steel substitutions on hardenability alone is a hazardous procedure.

3-234. **A Study of Several Kinds of High Strength Plate Steel.** George F. Comstock. *Metal Progress*, v. 46, Dec. '44, pp. 1248-1253.

Titanium has been substituted for the strategic vanadium in the high strength weldable steel plate used by the U. S. Navy for hull construction. Extensive tests on 19 laboratory heats of these two and other types of steel that have been used or suggested for high strength plate.

3-235. **The Mechanism of Failure of 18 Cr-8 Ni Cracking Still Tubes.** C. L. Clark and J. W. Freeman. *National Petroleum News*, v. 36, Dec. 6, '44, pp. R-854-R-856, R-858, R-859, R-860, R-862.

The deterioration and possible actual failure of 18% Cr, 8% Ni cracking still tubes in service is due to structural changes at the grain boundaries which are progressive in nature and are dependent on time, temperature and stress.

3-236. **18-8 Stainless Modified for Formability.** Wilson G. Hubbell. *Iron Age*, v. 154, Dec. 7, '44, pp. 78-82.

Columbium stabilized stainless steel, type no. 347, possesses proper ductility and good welding properties on the basis of tests described for forming aircraft parts subject to high temperatures.

3-237. **The Influence of Melting Conditions on the Physical Properties of Steel Castings.** H. T. Protheroe. *Metallurgia*, v. 30, Oct. '44, pp. 307-310.

Mechanical test results obtained from a number of cast steels. Examination of the data recorded during manufacture made and used in connection with mechanical test results in an effort to trace the factor or factors having the most pronounced influence on the quality of cast steel.

3-238. **How Fast Do Metals Freeze?** Harry A. Schwartz. *Foundry*, v. 72, Dec. '44, pp. 80-81, 236. 238, 240, 242, 244.

Experimental work on rate of solidification of steel castings. Variations in these findings and acceleration in freezing rate with passage of time may be accounted for by the contribution made by radiation and convection on apparent thermal conductivity.

3-239. **Retaining Physical Properties with Composition Change.** Thomas D. West. *Foundry*, v. 72, Dec. '44, pp. 93, 228, 230, 232.

In considering a change in alloying elements factors which must be considered when the same physical

properties are to be met are listed in the order of their importance; selection of alloys; correct deoxidants and deoxidation practice; and heat treatment. 2 ref.

3-240. **The Influence of the Centrifugal Process on the Physical Properties of Some Non-Ferrous Alloys.** W. W. Edens and J. F. Klement. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 393-406.

Data obtained in tests made with various non-ferrous alloys, sand cast, centrifugally cast and forged. Densities, chemical analyses, microstructures and tensile test values. Photomicrographs to show the variations in the microstructure and tables to show the differences in analyses and physical properties.

3-241. **The Effect of Copper in Some NE and Low-Alloy Cast Steels.** C. T. Greenidge, M. C. Udy, and K. Grube. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 501-516.

Copper was added to three low alloy, 0.30% carbon, cast steels in amounts up to 0.50% and to a fourth steel in amounts up to 1.35%. First three steels corresponded to NE 8630 and 9430 grades and to a manganese-molybdenum type, while the fourth approximated an NE 8700 composition. Steels tested for hardenability by the end-quench or normalizing followed by tempering. Low temperature notched bar toughness determined on specimens similarly heat treated. 9 ref.

3-242. **Thin-Wall Steel Casting in Machine Construction.** K. Rudnik and H. Juretzek. *Maschinenbau, Der Betrieb,* v. 21, '41, pp. 217-21; *Chem. Zentr.,* II, '41, pp. 1550-1. *Alloy Metals Review,* v. 3, Sept. '44, p. 2.

To replace nickel alloy materials, new Cr and Cr-Mo steels have been developed. In order to save Mo, steels containing 0.1% Mo and 0.1% V were developed. By various heat treatments, steel containing 1% Cr and 0.1% Mo of 60 to 75, 75 to 90, and 90 to 110 tensile strength can be obtained. In special cases, 110 to 125 tensile strength was obtained for thin-wall specimens of small dimensions. For larger parts, oil-tempered steel containing Cr 1.8% and Mo 0.3% is employed. High impact strength is found in a steel containing 2 to 3% Cr and 0.5% Mo. Wear resistance is increased by addition of 1.5% Mn. Hard steels of 75 to 90 tensile strength for thin wall specimens may contain up to 12 to 14% Mn. High endurance limit and resistance to heat and corrosion are found in steels containing 15% Cr and up to 0.5% Mo. Cr-Mo-V and Mn-Cr cast steels have very high endurance limit. Steels containing 30% Cr with and without Mo are resistant to strong acids and alkalies. Steels containing 14 and 18% Cr combine high yield point with high elongation values and high break points. Fields of application in the construction of vehicles, naval engines, high-pressure boilers, and aircraft are listed.

3-243. **The Behavior of Metals Deformed by Compression.** F. Körber, A. Eichinger, and H. Möller. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* v. 26, no. 6, '43, pp. 71-89. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 161-A.

An investigation of the effects of previous cold-compression on the ductility of mild steel and cast steel has already been reported (See *Journal* Iron and Steel Institute, no. 1, '43, p. 197-A). In the present paper tests are described the object of which was to study how deformation at 100°, 250°, 400°, 550° and 700° C. by longitudinal and transverse compression followed by two months aging affected the properties of very low carbon steel. The brittleness increased with increasing deformation temperatures up to 400° C., but there was no embrittlement after compression at 700° C. It is not the deformed structure alone which is responsible for the embrittlement, but the lattice distortion, the extent of which depends on the temperature of deformation. Factors which also contribute to the embrittlement are the sensitivity to aging which depends on the amount of aluminum added to the steel, and the weakness which develops at the grain boundaries resulting in a transverse preferred orientation after compression.

3-244. **The Susceptibility to Aging of High-Tensile Structural Steels.** A. Fry and L. Kirschfeld. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 87, March 6, '43, pp. 123-127. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 162-A.

An investigation of the aging properties of high-tensile steels was carried out to determine whether they had any tendency to become brittle after plastic deformation. Basic open-hearth steels made by the normal process had a marked embrittlement tendency. Additions of more than the normal amount of aluminum to insure thorough deoxidation reduced this tendency; normalizing alone did not reduce it. The steels tested included specimens from the broken bridge over the Albert Canal in Belgium and the Zoo bridge in Berlin, and they afforded evidence of the importance of using non-aging steels for such structures.

3-245. **Avoiding Dimpling Failures in the New Aluminum Alloy Alclad 75S-T.** A. A. Bibee. *Iron Age,* v. 154, Dec. 21, '44, pp. 38-43.

Alclad alloy for airframe skins has a combination of strength and toughness superior to any of the aluminum alloys used up until recently. Designated as 75S, it contains approximately 90% aluminum, with magnesium, zinc and copper. In its heat treated condition, it is in general less readily fabricated than Alclad 24S-T. Accelerated corrosion tests have indicated that Alclad 75S-T resists corrosion as well as Alclad 24S-T. Stress corrosion cracking of Alclad 75S-T is not likely because of the electrolytic protection afforded by the cladding. None has been observed to date after a year's seacoast exposure of highly stressed, plastically deformed samples. Comparative typical properties of Alclad 75S-T and 24S-T are given.

3-246. **Physical Properties of Some National Emergency Steels. II.** William C. Stewart and Richard E. Wiley. *Iron Age,* v. 154, Dec. 21, '44, pp. 54-57.

Test data on the strength and creep of a number of NE steels and SAE 4140 at elevated temperatures with

a view to determining whether they would meet Navy requirements for high temperature bolt steels. They do not.

3-247. **Tensile Properties of Unstable Austenite and Its Low-Temperature Decomposition Products.** A. H. Cottrell. Iron and Steel Institute, Advance Copy, Nov. '44, 12 pp.

Mechanical properties and transformation behavior of an air-quenched nickel-chromium-molybdenum steel were studied at various stages before, during and after the austenite-martensite change. Part of the S-curve was determined as a preliminary to the investigation. Tensile properties of martensite obtained by air-quenching were examined during cooling and show that the material possesses high strength and appreciable ductility. Minimum ductility in the metal is obtained immediately after the completion of the change to martensite. These results are discussed briefly in relation to the problem of cracking encountered in this type of steel after welding. 12 ref.

SECTION IV

STRUCTURE

4-1. **X-Ray Crystallography.** Arthur G. Barkow. *Industrial Radiography,* v. 11, no. 2, Fall '43, pp. 24-25, 28-30.
A resume of the important fundamentals of crystal structure.

4-2. **Pseudomorphs of Pearlite in Quenched Steel.** Owen W. Ellis. *Canadian Metals & Metallurgical Industries,* v. 6, no. 12, Dec. '43, pp. 24-27.
Induction heating provides the means for raising the temperature of steel so rapidly that the point is almost reached where the steel, after heating, can be quenched before any change has occurred in it, other than that of alpha iron to gamma iron. 6 ref.

4-3. **Block Structure of Cadmium Single Crystals.** Hans Mahl and Iwan N. Stranski. *Zeitschrift für Metallkunde,* v. 35, no. 7, July '43, pp. 147-151.
Valuation of the electron microscope absorption of Cd single crystals.

4-4. **The Structure of Ingot Iron Containing Lead.** L. Northcott and D. McLean. *Engineering,* v. 157, no. 4069, Jan. 7, '44, pp. 18-20.
Microstructure; machinability; X-ray examination.

4-5. **Recrystallization and Twin Relationships in Silicon Ferrite.** C. G. Dunn. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1691, 15 pages.
It has been shown that recrystallization of plastically deformed silicon ferrite can produce complex groups of grains or particles twin-related through more than one order or generation of twins. Twins in the form of small grains or particles within a large recrystallized grain do not have stable boundaries at high temperatures. The large grain in such a group usually absorbs the small particles. In other cases twin boundaries are changed by growth of one grain at the expense of the other. 16 ref.

4-6. **Twinning in Zinc Oxide.** M. L. Fuller. *Journal of Applied Physics,* v. 15, Feb. '44, pp. 164-170.
A crystallographic analysis of a characteristic shape of particle found in zinc oxide produced by burning zinc vapor has been made with the aid of the electron microscope. This particle consists of four needle-shaped crystals united at a common juncture. The spatial angles among the four crystals were determined

from stereoscopic micrographs with the use of the stereographic projection. The crystals were found to be united by twinning on planes of the form (112).

4-7. **A Note on the Microstructure of High Silicon Acid-Resisting Iron.** J. E. Hurst and R. V. Riley. *Metallurgia,* v. 29, Jan. '44, pp. 145-147.

An unusual type of etched structure, referred to as the "barley shell" structure, has been described by various investigators of the Fe-Si alloys. The authors have observed it in their examination of commercial Fe-Si alloys containing upwards of 19% Si, and have recorded some conditions of etching under which it is obtained and some observations on its characteristics.

4-8. **Model Construction.** E. M. Smith. *Metal Progress,* v. 45, March '44, pp. 510-511.

Model illustrating equilibrium or structural conditions in ternary systems.

4-9. **High-speed Tensile Impact Tests on Single-Crystal and Polycrystalline Bars of Copper.** E. R. Parker and E. A. Smith, *Metals Technology,* v. 11, April '44, Tech. Pub. 1704, 7 pp.

Investigations have shown that the tensile strength, yield strength and elongation generally increase with increasing strain rate. The investigation reported herein is an attempt to determine the reason for the increase in strength and elongation. 11 ref.

4-10. **The Structure of Anodic Oxide Coatings.** J. D. Edwards and F. Keller. *Metals Technology,* v. 11, April '44, Tech. Pub. 1710, 12 pp.

Use of special metallographic techniques for revealing the structure of anodic oxide coatings on aluminum has been demonstrated. Characteristic structure can be revealed in an oxide coating by microscopic examination, but it is evident that fine details—for example, pore size, pore spacing and profile at the metal-oxide interface—are beyond the resolving power of the optical microscope. Data regarding the fine structure of an oxide coating have been augmented by the use of an electron microscope. 9 ref.

4-11. **The Structure of Martensite.** H. Lipson and A. M. B. Parker. *Engineers' Digest,* v. 1, April '44, pp. 280-281.

Assumptions made in determining that carbon is present in martensite; the percentage of carbon in the martensite.

4-12. **Polishing Aluminum Alloys for Metallographic Examination.** H. K. Hardy. *Metal Treatment,* v. 11, Spring '44, pp. 37-44.

Not the least difficult part of metallographic examination is the satisfactory preparation of the specimen, particularly when dealing with the softer metals. Work which has been carried out in this direction and particulars of a method evolved giving satisfactory results with most aluminum alloys. 25 ref.

4-13. **Sub-Critical Decomposition of Austenite in Chromium Steels.** Eugene Paul Klier. Thesis, University of Notre Dame, 1944.

4-14. **The Transformation of Retained Austenite in High Carbon High Chromium Steel at Sub-Atmospheric Temperatures.** R. D. Potter. Thesis for M.Sc. Degree, Massachusetts Institute of Technology, 1943.

4-15. **Microstructure of a Series of Restrained Welds.** Robert McClure Stuchell. Thesis for M.S. Degree, University of Pittsburgh, June 1944.

4-16. **A Study of the Spheroidization of Pearlitic Malleable Iron.** Jun Hino. Thesis for M.S. in Metallurgical Engineering, University of Illinois, 1943.

4-17. **The Apparent Microstructure Produced by Hydrofluoric Acid Etching Reagents on Pure Iron and Iron-Silicon Alloys.** W. J. Wrazej. Iron and Steel Institute Advance Copy, April '44, 10 pp.

The investigation of the etching of iron-silicon alloys as well as pure (electrolytic) iron and also plain carbon steel and cast iron shows that, in all cases, when hydrofluoric acid is used as the etching reagent, the surface of the micro-samples is covered with scars (etch markings). Such scars, called "barley-shell" markings, appear when iron fluoride formed during the etching has the opportunity to crystallize (e.g., in the presence of alcohol or of alcoholic picric acid solution).

4-18. **Orientations in Diffusion Layers.** Shueling Woo, Charles S. Barrett and Robert F. Mehl. *Metals Technology,* v. 11, June '44, T.P. 1694, 10 pp.

New data on the orientation relationships occurring between phase layers formed by diffusion, in the Cu-Zn system, furnishes further evidence in support of the principle. 21 ref.

4-19. **Precipitation and Reversion of Graphite in Low Carbon, Low Alloy Steel in the Temperature Range 900° to 1300° F.** G. V. Smith, R. F. Miller and C. O. Tarr. *Metals Technology,* v. 11, June '44, T.P. 1695, 6 pp.

Graphitization of low carbon, low alloy steel, experimental procedure, discussion of results, 12 ref.

4-20. **The Bainite Reaction in Hypoeutectoid Steels.** E. P. Klier and Taylor Lyman. *Metals Technology,* v. 11, June '44, T.P. 1696, 26 pp.

The constitution of bainite is not well understood and divergent views have been expressed as to its mode of formation. A combination of dilatometric, microscopic and X-ray methods has been brought to bear upon the problem in the hope of some elucidation of the bainite reaction as it occurs in hypo-eutectoid steels. 22 ref.

4-21. **A Numerical Rating Method for the Routine Metallographic Examination of Commercial Magnesium Alloys.** P. F. George. American Society for Testing Materials Preprint 33, June '44, 7 pp.

With the rapid increase in the metallographic work on magnesium alloys and the difficulty of obtaining trained metallographers, it became necessary to develop a method for routine examination of these alloys, whereby inexperienced persons could record a microstructure. Such a method is described here and in-

cludes the specimen preparation, etching technique, and a rating system for recording the microstructure as a series of numbers.

4-22. **An X-Ray Study of the Copper-Manganese Binary Alloy System.** L. D. Ellsworth and F. C. Blake. *Journal of Applied Physics,* v. 15, June '44, pp. 507-512.

The X-ray study reported was made to determine whether superstructures are present in the copper-manganese binary alloy system. 4 ref.

4-23. **Influence of Preliminary Deformation on the Decomposition of Austenites on Cooling.** *La Technique Moderne, Engineers' Digest,* v. 1, June '44, p. 384.

The decomposition of austenites at a constant temperature in the upper transformation range takes place as a process of germination and growth. The graphs of quantity-change against time show an initial period of inhibition, followed by a period of acceleration and a final slower period.

4-24. **Unusual Microstructures.** T. H. Schofield. *Iron & Steel,* v. 17, May 18, '44, pp. 407-408.

Ferrite envelopes in mild and medium C steels.

4-25. **Acid-Resisting Iron.** J. E. Hurst. *Iron & Steel,* v. 17, May 18, '44, pp. 425-426.

An unusual type of structure has been noted in commercial iron-silicon alloys containing upwards of 10% of Si, when etched under certain conditions. This structure, which has been observed by other investigators, is not "real" but its formation under the conditions described is characteristic of the high silicon iron alloys.

4-26. **The Carbide Phase.** J. E. Hurst and R. V. Riley. *Iron & Steel,* v. 17, May 18, '44, pp. 427-429.

Occurence in high silicon Fe-C alloys.

4-27. **Martensite.** H. Lipson and Audrey M. B. Parker. *Iron & Steel,* v. 17, May 18, '44, pp. 436-438.

New experimental evidence concerning the lattice structure.

4-28. **Cementite.** N. J. Petch. *Iron & Steel,* v. 17, May 18, '44, pp. 438-440.

Interpretation of the crystal structure.

4-29. **Heterogeneity.** T. Swinden. *Iron & Steel,* v. 17, May 18, '44, pp. 476-477.

Examination of a rimming-steel ingot containing 0.29% C.

4-30. **The Interpretation of the Crystal Structure of Cementite.** N. J. Petch. The Iron and Steel Institute. Advance Copy, Feb. '44, 8 pp.

Previous work on the structure of cementite extended; cementite a framework of close-packed iron atoms held together by metallic bonding, with the small carbon atoms in the largest interstices, these atoms also being held in position by bonding which has a certain degree of metallic nature; possibility of variation in the cementite composition is considered, and experimental work described.

4-31. **Microstructure.** W. J. Wrazej. *Iron & Steel,* v. 17, June '44, pp. 506-508.

"Barley-shell" markings produced by hydrofluoric acid etching agents.

4-32. **The Preparation of Sections of Copper-Lead Alloys for Metallographic Examination.** R. W. K. Honeycombe. Australian Institute of Mining and Metallurgy *Proceedings,* no, 133, March '44, pp. 29-33.

Polishing technique; the etchant and the alloy composition; alternative method for alloys containing tin. 3 ref.

4-33. **The Dissociation of an Alloy of Copper, Iron, and Nickel; Further X-Ray Work.** Vera Daniel and H. Lipson. *Royal Society Proceedings,* v. 182, June '44, pp. 378-387.

Intensities modified in a systematic way by extinction, and, after introducing a correction for extinction, the theory advanced can account for all the data. Bearing of the present observations on the kinetics of phase change discussed. 6 ref.

4-34. **Internal Stress Created by Plastic Flow in Mild Steel, and Stress-Strain Curves for the Atomic Lattice of Higher Carbon Steels.** S. L. Smith and W. A. Wood. *Royal Society Proceedings,* v. 182, June '44, pp. 404-414.

External applied stress above the yield is not balanced primarily by simple displacement of the atoms but by a new type of secondary internal stress brought about by the process of plastic flow; this secondary stress, being of a permanent nature, can be measured by the residual lattice strains exhibited by the lattice after removal of the external stress. 6 ref.

4-35. **Etchant for Silver Solders.** L. P. Tarasov. *Metal Progress,* v. 46 Sept. '44, page 484.

2% ferric chloride solution acts slowly enough to permit the structural details of the dark constituent to be revealed clearly. The desired degree of contrast is obtained by controlling the etching time, which is generally in the range of 5 to 30 sec.

4-36. **The Dimensional Stability of Steel. Part I—Subatmospheric Transformation of Retained Austenite.** Stewart G. Fletcher and Morris Cohen. American Society for Metals 1944 Preprint No. 27, 23 pp.

A combined X-ray and dilatometric procedure described for making a quantitative study of sub-cooling transformations. Detailed charts given to show the extent of austenite decomposition as a function of subatmospheric temperature and time of prior aging at room temperature. 28 ref.

4-37. **Metallurgical Progress and the Chemist.** *Chemical Age,* v. 51, August 5, '44, pp. 134-136.

Some recent developments.

4-38. **Grain Shape and Grain Growth.** David Harker & Earl R. Parker. American Society for Metals, 1944 Preprint No. 38, 40 pp.

Ability of a metal to show grain growth depends not at all on grain size but only on grain shape. When all grains in a metal have flat faces making 120° angles with adjacent faces, there can be no grain growth, no matter what the grain size. Some specimens show

grain growth on annealing, others do not; but the grain shape always approaches that of the ideal stable structure.

4-39. **The Metallographic Examination of Aluminum Alloys.** N. H. Mason, G. J. Metcalfe, and B. W. Mott. *Metallurgia* v. 30, August '44, pp. 212-214.

Type of microscope, method of illumination of specimens, and methods of mounting and polishing specimens of alloys of different types. Some microstructural characteristics of cast and wrought commercial alloys are described. 15 ref.

4-40. **The Orientation Texture at the Surface of Cast Metals.** Gerald Edmunds. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1773, 1 p.

Zinc casting solidified against a molten lead surface was found to have the same surface orientation texture, (001) parallel to the surface as other zinc and cadmium castings. Aluminum and alpha-beta brass die castings were found to have random grain orientation textures at the surface.

4-41. **Cleavage Structures of Iron-Silicon Alloys.** Carl A. Zapffe and Mason Clogg, Jr. American Society for Metals 1944 Preprint no. 37, 36 pp.

The metallographic technique referred to as fractography is applied to a series of alloys in the iron-silicon binary system. These alloys are especially suitable for this technique and provide a great number of interesting cleavage patterns, which are shown to reveal subtle intra-crystalline processes not observable with the orthodox polish and etch technique. 24 ref.

4-42. **The Effect of Cold Rolling on the Structure of Hadfield Manganese Steel.** Norman P. Goss. American Society for Metals 1944 Preprint no. 41, 10 pp.

X-ray surface diffraction diagrams of cold rolled 13% manganese strip steels given a reduction of 87% remained austenitic. In view of the X-ray evidence it is believed that the extreme hardness attainable by cold rolling is due to the smallness of the crystallites.

4-43. **The Apparent Microstructure Produced by Hydrofluoric Acid Etching Reagents on Pure Iron & Iron Silicon Alloys; "Barley-Shell" Markings.** W. J. Wrazej. Paper for Iron & Steel Institute, April '44, *Engineers' Digest*, v. 1, Oct. '44, pp. 629-630.

Causes of markings.

4-44. **Preferred Orientation—an Asset and a Liability.** J. K. Stanley. *Metal Progress*, v. 46, Dec. '44, pp. 1254-1258.

Rolled or forged metal may have "fiber" due to segregation of metallographic constituents. Directional properties ("anisotropy," to the scientist) due to preferred orientation of the basic metallic crystals are seldom of advantage except in the production of magnetic silicon-iron sheet.

4-45. **Vanadium—In Gray Iron Castings.** R. G. McElwee and T. E. Barlow. *Foundry*, v. 72, Dec. '44, pp. 88-89, 246, 248, 250, 252.

Effect of vanadium on the graphite structure.

4-46. **The Structure of Hard-Metal Alloys.** W. Dawihl and J. Hinnüber. *Kolloid Zeitschrift*, v. 104, '43, pp. 233-236. *Alloy Metals Review*, v. 3, Sept. '44, p. 1.

Experiments were performed to explain the hardness and wearing qualities of hard-metal alloys, obtained by incorporating 6% Co in WC alloys. Determinations of the coefficient of expansion as a function of increasing volume percentage of Co showed up to about 10% Co little or no expansion; beyond 10% linear increase is noticeable. The bending strength plotted as a function of the applied sinter temperatures, for alloys with different (3, 6, 11%) Co percentages also indicated that the great rigidity of the hard alloys must be due to a strong WC framework which tends to be broken up as the Co content is increased beyond a certain limit.

4-47. **The Constitution of Aluminum-Copper-Magnesium Alloys at 460° C.** A. T. Little, W. Hume-Rothery and G. V. Raynor. Institute of Metals *Journal*, v. 70, Oct. '44 pp. 491-506.

Range of alloys examined was sufficiently great to include the compositions of all the solid phases with which the aluminum-rich or alpha solid solution is in equilibrium. At 460° C. the phase boundary is divided into four sections, corresponding to equilibrium with the $CuAl_2$, S.T. and liquid phases respectively. The alpha solid solubility curve was determined accurately at 460° C. and 375° C. and the triangles representing the (alpha-CuAl-S) three-phase fields were established at 460° C. The composition of the S phase corresponds with the simple formula Al_2CuMg.

SECTION V

POWDER METALLURGY

Process and Product

5-1. **Some Modified "Heavy Metal" Alloys—Effect of Composition on Properties.** H. H. Hausner. *Metals and Alloys*, v. 18, no. 6, Dec. '43, pp. 1335-1338.
Physical and electrical properties of high-density W-Ni-Cu powder metallurgy "alloys." 5 ref.

5-2. **Introduction to Powder Molding.** Irving D. Press. *Tool & Die Journal*, v. 9, no. 10, Jan. '44, pp. 78-85.
Description and chart of press and die. Die and product design consideration; lateral flow and powder distribution; die design: Simplicity vs. cost; press selection.

5-3. **Powder Metallurgy.** Frances H. Clark. *Mining & Metallurgy*, v. 25, no. 446, Feb. '44, pp. 81, 95.
Several applications in ordnance—but little experimentation in untested fields.

5-4. **Magnesium Powder Fabrication.** *Light Metal Age*, v. 2, Jan. '44, pp. 10-13.
Fabrication steps; the "hammer-mill" process; chipping.

5-5. **Pressing and Sintering Carbide Tool Tips.** W. T. Muirhead. *Metals & Alloys*, v. 19, Feb. '44, pp. 369-372.
Use of sintered carbide tools for the highest speed machining of steel and other materials. The tools are made by brazing carbide tips to a steel or cast iron shank. The manufacture of these tips, described in this article, is a major application of powder metallurgy. Presses and dies used are described.

5-6. **Efficient Sintering with a Dwight Lloyd Unit.** M. V. Cover. *Iron Age*, v. 153, March 2, '44, pp. 46-49.
How to increase the amount of sinter made in a Dwight Lloyd machine by the use of proper materials and efficient design. Other critical factors influencing output.

5-7. **Magnesium Powder Fabrication.** *Light Metal Age*, v. 2, March '44, pp. 17-19, 24, 30, 38.
Milling and classification, detailing recommended methods, machinery and precautions.

5-8. **Design of Powder Metallurgy Parts.** M. T. Victor and C. A. Sorg. *Metals & Alloys*, v. 19, March '44, pp. 584-589.

Competitive advantages and disadvantages of powder metallurgy as a fabricating process, and several basic design rules specially applicable to powder metallurgy parts.

5-9. **Latest Developments in the Art of Powdered Metallurgy.** P. D. Aird. *Modern Industrial Press,* v. 6, March-April '44, pp. 36, 40, 54.

Techniques which will be used after war is over.

5-10. **Large Carbide Die Nibs Formed by Hot Pressing.** *Metal Progress,* v. 45, April '44, pp. 681-682.

"Hot press" method which incorporates in one single operation the three distinct processes of pressing, semi-sintering, and sintering.

5-11. **Powder Metallurgy and the "Magal" Age.** J. L. Bray. *Industry & Power,* v. 46, April '44, pp. 62-64, 120.

Through an analysis of the advantages and limitations of the process of making products from mixtures of metal powders, Bray reaches the conclusion that although the procedure is by no means a panacea for foundry or machine shop ills it has a most promising future.

5-12. **Copper in Powder Metallurgy.** J. J. Cordiano. Electrochemical Society Preprint No. 85-4, April '44, 10 pp.

After describing briefly the three methods of making copper powder (1) by electrolysis, (2) by reduction of the oxide, and (3) by atomization, results are reported on the effect of particle size and shape of copper powders. Description of the production of porous bearings; tungsten-copper electrode tips; and steel-backed copper-base bearings. 9 ref.

5-13. **Electrodeposition of Copper Powder.** W. H. Osborn and S. B. Tuwiner. Electrochemical Society Preprint No. 85-5. April '44, 10 pp.

Powder production is made a part of the process of electrolytic refining of copper. The powder is a by-product of the refining operation. Great potential economy is possible, but can be realized only with large scale production of this powder which in turn awaits the development of a wider variety of uses for the powder. 14 ref.

5-14. **Presses and Processes for Metal Powder Products.** E. V. Crane and A. G. Bureau. Electrochemical Society Preprint No. 85-14, 23 pp.

The powder metallurgy art as it exists in America today. Standard methods of making a wide diversity of powder metal machine parts and finished products. Recommended procedures for making composite articles of metal and non-metal, such as abrasive wheels. Special machinery for making a wide diversity of compacts.

5-15. **The Determination of Particle Size in Powder Metallurgy.** Philip R. Kalischer. Electrochemical Society Preprint No. 85-15, 6 pp.

Four methods for sizing fine powders are described and discussed: Microscope; air elutriation; liquid elutriation; and gravitational fractionation.

5-16. **Bonding Metal Particles by Heat Alone Without Pressure.** Laurence Delisle. Electrochemical Society Preprint No. 85-16, 16 pp.

The results of microscopic examination and a few physical tests of specimens made of metal powder by sintering in hydrogen for three hours at various temperatures. Iron, copper and silver powders were investigated. Particle size is a very important factor on the extent to which bonding between particles proceeds and on the density of the sintered specimens. 13 ref.

5-17. **Superfine Grinding of Metal Powders.** *Light Metals,* v. 7, April, '44, pp. 157-160.

Resume of recent research by Olbrich on comminution of aluminum in the vibrating ball mill.

5-18. **Powder Metallurgy.** W. D. Jones. *Aircraft Production,* v. 6, May '44, pp. 226-229.

A survey of the possibilities of this technique. Dimensional changes, limitations of process, porous bearings, non-porous applications, contact materials, diamond-impregnated tools, use as raw material.

5-19. **Large Cemented Carbide Parts.** *Steel,* v. 114, May 29, '44, p. 9.

Weights up to 100 lb. or more now may be produced by new hot press method. "Hot press" method which incorporates in one single operation three distinct processes of pressing, semi-sintering, and sintering.

5-20. **Hot Pressing and Sintering of Carbide Powders.** *Iron Age,* v. 153, June 8, '44, p. 71.

Ability to produce cemented carbide parts too large to be sintered in available furnaces—as well as special, thin-walled parts that tend to go out of round when sintered in the regular way after pressing—has been made possible by the development of a "hot press" method which incorporates in one operation the three processes of pressing, semi-sintering and sintering.

5-21. **Parts from Metal Powders.** Carl Claus. *Aeronautical Engineering Review,* v. 3, May '44, pp. 47, 49, 145.

Accomplishments; production of porous structures; accurate dimensions without machining, oil absorption for lubrication; limitations of powder metallurgy. Present production; future trends.

5-22. **Some Aspects of Powder Metallurgy.** J. C. Chaston. *Metal Treatment,* v. 11, Spring '44, pp. 15-18, 36.

Sintering of single-phase metals, the mechanism of sintering, sintering when a liquid phase is present; aluminum and aluminum alloys. 5 ref.

5-23. **Surface Distribution in Comminution of Certain Minerals.** S. S. Yavasca. Thesis for M.Sc. Degree, Massachusetts Institute of Technology, 1944.

5-24. **Experimental Study of the Principles of Comminution.** R. T. Hukki. Thesis for D.Sc. Degree, Massachusetts Institute of Technology, 1944.

5-25. **Fracture and Comminution of Brittle Solids.** Eugene F. Poncelet. *Mining Technology,* v. 8, May, '44, T.P. 1684.

Comminution of brittle solids occurs in: Deformation of the solid to be comminuted by the application of out-

side forces resulting in tensile stress, development of one or more cracks as a direct result of these stresses, formation of compression and transverse pulses caused by these breaks to travel through the solid, formation of residual particles of smaller and smaller sizes. 23 ref.

5-26. **Particle Size Determination for Metal Powders.** *Iron Age,* v. 153, June 15, '44, pp. 86-87, 166.

The use of a photocell to determine particle size makes available a simple method of calculating sizes of fine powders. This new apparatus can be employed for setting up standards and controlling production. Factors influencing the bonding of metal powders.

5-27. **Review of Patents on Electrolytic Methods for Making Powdered Metals.** Joseph Rossman. Electrochemical Society Preprint 85-21, 4 pp.

An outline review is given of United States patents relating to electrolytic methods for making powdered metals.

5-28. **The Early Days of Nickel-Tungsten Powder Metallurgy.** M. Pirani. Electrochemical Society Preprint 85-22, 6 pp.

A method is described for the production of fine nickel-tungsten wires by cold rolling and drawing a well-sintered, pressed mixture of 90 to 94% fine tungsten powder and 10 to 6% nickel powder. The process was carried out in 1907 to 1909.

5-29. **Presses and Processes for Metal Powder Products.** E. V. Crane and A. G. Bureau. *Iron Age,* v. 153, June 29, '44, pp. 36-41.

Making of porous products such as bushings and then solid compression problems, showing different types of presses which have been used and others which offer advantageous features worthy of consideration.

5-30. **Carbide Parts Formed by Hot Pressing.** *Modern Industrial Press,* v. 6, June '44, p. 32.

Cemented carbide parts too large to be sintered in available furnaces, and special, thin-walled parts that tend to go out of round when pressed and sintered in the regular way, made possible at Carboloy Company, Inc., Detroit, by development of a "hot press" method which incorporates in a single operation the three distinct processes of pressing, semi-sintering and sintering.

5-31. **Presses and Processes for Metal Powder Products.** E. V. Crane and A. G. Bureau. *Iron Age,* v. 154, July 6, '44, pp. 62-67.

Principles for selection of dies, heat treatment and presses that have overcome many of the shortcomings of powder metallurgy techniques. 8 ref.

5-32. **Copper in Powder Metallurgy.** J. J. Cordiano. *Canadian Metals & Metallurgical Industries,* v. 7, July '44, pp. 33-35, 44.

Production to close specifications and applications in manufacture of parts. 9 ref.

5-33. **Processes for Making Metal-Powder Products.** E. V. Crane and A. G. Bureau. *Steel,* v. 115, July 24, '44, pp. 90-94.

Description of standard methods and equipment for making a wide diversity of powder-metal machine parts and products.

5-34. **What Brass Powder Parts Offer the Designer.** E. H. Kelton. *Machine Design,* v. 16, August '44, pp. 129-132.

Machine parts made of sintered brass powder at considerable savings.

5-35. **Design of Powdered Metal Parts.** W. H. Arata. *Product Engineering,* v. 15, August '44, pp. 561-564.

Advantages, limitations, design data, general physical properties and typical applications of powdered metal parts are presented as a guide in the design of machine components.

5-36. **Presses and Processes for Metal Powder Products.** E. V. Crane and A. G. Bureau. *Canadian Metals and Metallurgical Industries,* v. 7, August '44, pp. 27-31.

Physical factors of the powders; pressure welding; processing for porous or dense products; porous bushing production; dense products. 7 ref.

5-37. **The Preparation of Aluminum Powder.** A. G. Arend. *Paint Technology,* v. 9, April '44, pp. 79-80.

Practical details of methods of manufacture.

5-38. **Metal Sponges.** Carl Claus. *Metal Progress,* v. 46, Sept. '44, pp. 473-475.

Whereas porosity is an inherent property of powder compacts, and reduced or eliminated only be expensive operations, controlled porosity and permeability are the prime object of the producer's art. These factors are very adversely affected by such operations as reaming, boring, turning or grinding, all of which can usually be avoided if the purchaser will make known his true requirements in advance.

5-39. **Determination of Particle Size in Powder Metallurgy.** Philip R. Kalischer. *Canadian Metals and Metallurgical Industries,* v. 7, Sept. '44, pp. 34-36, 42.

Gravitational fractionation with aid of photo cell applicable to process control.

5-40. **Copper Powder Metallurgy.** *Chemical Age,* v. 51, August 5, '44, p. 137.

Wide variety of components.

5-41. **Bonding Metal Particles by Heat Without Pressure.** Laurence Delisle. *Steel,* v. 115, Sept 18, '44, pp. 131, 134, 154, 156, 158, 160, 162, 164, 166.

Particle size greatly influences bonding and density of product. In working with iron, copper and silver, finer sizes provide better bond and denser structure; particle shape affects extent of bonding. Cold working powder lowers temperature for bonding.

5-42. **Metal Powders.** *Scientific American,* v. 171, Oct. '44, p. 153.

Post-war uses for aluminum powder.

5-43. **British Electrolytic Copper Powder.** H. W. Greenwood. *Metallurgia,* v. 30, August '44, pp. 181-184.

The economic production of electrolytic copper powder in England has presented many difficulties and until recently the amount consumed in Britain was imported.

As a result of research and development, during the last few years a satisfactory solution to the problem has emerged and electrolytic copper powder production is now stabilized.

5-44. **Cemented Carbides.** *Automobile Engineer*, v. 34, Sept. '44, pp. 365-371.

The methods employed in the manufacture of Wimet, among the first of the cemented carbide materials made in this country. The technique employed in preparing the powders is described. The pressing, presintering, rough machining and final sintering equipment and methods are discussed.

5-45. **Piston Rings.** J. A. Judd. *Automobile Engineer*, v. 34, Sept. '44, pp. 379-380.

A new and important application of powder metallurgy.

5-46. **Products from Metal Powders.** *Modern Industry*, v. 8, Oct. 15, '44, pp. 33-36.

What possibilities for new and better products does powder metallurgy offer? How important is it as a cost-saver? Answers from war experience, plus facts about limitations that potential users need to know.

5-47. **Powder Metals.** *Business Week*, no. 791, Oct. 28, '44, pp. 74-76, 77-80.

Broad outlines of the art, its major exponents, some of its many present applications to metal and alloy products, and a tentative dip into its post-war future.

5-48. **The Sintering of Metal Powders—Copper.** C. J. Bier and J. F. O'Keefe. *Metals Technology*, v. 11, Oct. '44, T. P. 1765.

Three variables affecting the sintering process; namely, briquetting pressure, sintering temperature and time in hot zone. 5 ref.

5-49. **Powder Metallurgy as Applied to Cemented Carbides.** W. R. Jackson. *Canadian Mining & Metallurgical Bulletin*, no. 390, Oct. '44, pp. 393-414.

Manufacture of the powders; physical properties; application; brazing; grinding; design; suggestions for care of cemented carbide tools.

5-50. **Filters Made of Porous Metal Can Be Fabricated in Special Shapes.** Earl W. Reinsch. *Product Engineering*, v. 15, Nov. '44, pp. 769-771.

Material made from tiny metal spheres can now be produced to specified and controlled porosity. The material has already found numerous applications, including breathers, filters, flame arresters, and fluid meters. Details of the characteristics of the material and fabrication methods described.

5-51. **Powder Metallurgy.** Earle E. Schumacher and Alexander C. Souden. *Metals and Alloys*, v. 20, Nov. '44, pp. 1327-1339.

History; manufacture; processing operations; products and applications; advantages and limitations. 68 ref.

5-52. **The Physics of Sinter-Metal Contacts.** R. Holm. *Kolloid Zeitschrift*, v. 104, '43, pp. 231-233. *Alloy Metals Review*, v. 3, Sept. '44, p. 1.

High-current switches operating under oil or water are suitably made from sintered W or Mo, saturated with molten Cu or Ag. For low-current switches sintered W is more suitable provided the applied e.m.f. is high enough to break the covering oxide film.

5-53. **Large Carbide Parts Formed by New Hot Pressing Method.** *Industrial Heating,* v. 11, Dec. '44, pp. 2024, 2026, 2028.

Development of a "hot press" method which incorporates in one single operation the processes of pressing, semi-sintering, and sintering.

SECTION VI

CORROSION

6-1. **Investigations of Stress Corrosion.** G. Wasserman. *Metal Industry,* v. 63, no. 22, Nov. 26, '43, p. 346.

Results of tests for stress corrosion on an Al alloy.

6-2. **Metallic Materials.** H. W. Gillett. *Steel,* v. 114, no. 2, Jan. 10, '44, 98-108.

Special tests for such factors as corrosion and wear resistance.

6-3. **Bakelite Board as a Source of Corrosion.** H. L. Halstrom. *Engineers' Digest,* v. 1, no. 2, Jan. '44, p. 114.

An explanation of bakelite as the cause of corrosion of metals under certain conditions even though considered a stable material.

6-4. **Turbine Blade Deposits.** Frederick G. Straub. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 224-225.

Their occurrence, modes of formation and treatment.

6-5. **Stress-Corrosion Cracking of 70-30 Brass by Amines.** H. Rosenthal and A. L. Jamieson. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1660. 9 pages.

In the presence of moist air, amines can cause season cracking of stressed brass. Under the conditions of these tests the primary amines are more active in causing cracking than the secondary or tertiary amines. 6 ref.

6-6. **Galvanic Corrosion.** R. H. Brown. American Society for Testing Materials *Bulletin,* no. 126, Jan. '44, pp. 21-26.

Potential differences; effects of polarization and resistance; types of control; current distribution; alleviation of galvanic corrosion. 24 ref.

6-7. **Mechanism of Corrosion Processes.** R. M. Burns. American Society for Testing Materials *Bulletin,* no. 126, Jan. '44, pp. 17-20.

Electrochemical nature of corrosion; formation of protective films; influence of electrode polarization; application of polarization curves. 6 ref.

6-8. **Cylinder-Bore Wear and Corrosion.** Alex Taub. *Automotive and Aviation Industries,* v. 90, March 1, '44, pp. 36-38, 60.

Cylinder wall temperature, spark timing, effect of fuel, the oil film as a protection against corrosion, piston ring design.

6-9. **Deaerators Make Difficulties for Testing Chemists.** J. R. McDermet. *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 366-369.

Function of a deaerator; ammonia and CO_2 function as electrolysis; CO_2 a weak acid in solution.

6-10. **Corrosion.** *Automobile Engineer,* v. 34, March '44, p. 114.

Improved resistance of cladded Al-Zn-Mg alloys.

6-11. **Laboratory Evaluation of Corrosion Resistance of Bearing Alloys.** L. M. Tichvinsky. Electrochemical Society Preprint No. 85-2, April '44, 16 pp.

Testing equipment and procedures used at the U. S. Naval Engineering Experiment Station for laboratory determination of corrosion characteristics of bearing alloys.

6-12. **The Effect of Specimen Position on Atmospheric Corrosion Testing of Steel.** C. P. Larrabee. Electrochemical Society Preprint No. 85-8. April '44, 8 pp.

Methods of exposing atmospheric corrosion test specimens described. It is shown that steel specimens, when mounted on racks at an angle of 30° to the horizontal, corrode less on the surface exposed to the sky than on the side toward the ground. In applications such as roofs where the underside of the sheet is not exposed, the expected life might be two or more times that indicated by tests where both sides are exposed. 6 ref.

6-13. **"Season Cracking" in Cartridge Brass.** L. E. Gibbs. *Metal Progress,* v. 45, May '44, pp. 881-886.

Cartridge brass is high enough in zinc to be among the alloys susceptible to stress corrosion. To avoid it in ammunition, residual internal stress must be held below a certain value. 5 ref.

6-14. **Passivity in Copper-Nickel and Molybdenum-Nickel-Iron Alloys.** Herbert H. Uhlig. Electrochemical Society Preprint No. 85-20, 10 pp.

Passivity in an alloy appears at a critical composition which for ferrous alloys is related to the tendency of the d band of electronic energy states to fill with electrons. According to magnetic and specific heat data it is known that the d band of Cu-Ni is filled at 60 atom % Ni. Corrosion data show that transition from passivity to activity occurs at this same nickel content.

6-15. **Chemical Treatment of Magnesium for Enamelling.** *Light Metals,* v. 7, April '44, pp. 173-176.

Results of comparative corrosion tests on magnesium alloy sheet, chemically pre-treated in phosphate or chromate baths with subsequent coating with gray, synthetic stoving enamel.

6-16. **Corrosion Resistance of Some Commercial Aluminum Alloys in Seawater.** J. F. J. Thomas and A. C. Halferdahl. *Canadian Chemistry and Process Industries,* v. 28, April '44, pp. 257-259.

Five aluminum alloys were exposed bare, alumilited, and sealed with dichromate, and Bengough-Stuart treated at the half-tide position near Halifax, N. S., and at Esquimalt, B. C. They were also put in aerated

Atlantic seawater in a total immersion test in the laboratory and in a salt spray test.

6-17. **High - Temperature - Steam Corrosion Studies at Detroit.** I. A. Rohrig, R. M. Van Duzer and C. H. Fellows. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 277-290.

Determines the rate of corrosion and the relative corrosion resistance in an unstressed condition of various materials that could be used in the construction of steam generators, piping, and turbines. Specimens were exposed in a steam atmosphere at 380 psi. and at temperatures of 925 and 1100° F. The investigation required 5 years for completion. 46 different materials were studied under plant-operating conditions, and samples were exposed in superheated station steam for periods ranging from 4000 to 16,000 hr. Weight-loss, hardness, and metallographic data were obtained after successive exposure periods for many of the samples. Trends in the corrosion rate were plotted for some of the materials.

6-18. **The Corrosion of Alloy Steels by High-Temperature Steam.** G. A. Hawkins, J. T. Agnew, and H. L. Solberg. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 291-295.

Additional test results obtained at the Engineering Experiment Station of Purdue University dealing with the relative resistance to corrosion by steam of unstressed specimens of various alloy steels at temperatures between 1000 and 1800° F. All of the steels tested, except for the very high chromium-nickel alloys, show rapid corrosion beyond a limiting temperature which increases with chromium content. Data are presented relative to the chemical composition of the scale layers formed during tests at 1500 and 1800° F.

6-19. **Surface Protection of Aircraft Parts.** V. S. Sorenson and S. G. Andrews. *Iron Age,* v. 153, May 18, '44, pp. 74-77.

Research program carried out by Lockheed Aircraft Corp., to solve finish problems arising from the increased use of low carbon steels in place of nickel-bearing stainless steels; growing importance of galvanic corrosion in aircraft construction and fundamental concepts of this type of corrosive attack discussed. Results of investigations on comparative protection afforded by various combinations of phosphate treatments and additional coatings also given, and finishes now in use on various steel parts listed.

6-20. **Corrosion-Resistant Materials in Pickling, Cleaning and Plating Operations.** Edward Engel. *Products Finishing,* v. 8, June '44, pp. 68-72, 74, 76, 78, 80.

Complex factors of corrosion, complex forms of corrosion, corrosion resistant metals and structural materials, corrosion resistant flexible linings, corrosion resistant rigid and brick linings, acid and chemical resistant cements, plating rack insulation, protective paints, corrosion vapor control at the source, physical requirements of corrosion resistant materials used in these operations.

6-21. **Corrosion Resistance of Sandblasted 18-8 Stainless Steel.** F. A. Truden. *Metal Finishing,* v. 42, June '44, pp. 335-337.

Tests may not prove anything conclusively, but they give an indication of what may be expected when stainless steel is sandblasted. Loss in weight by corrosion is considerably greater in the half-hard specimens in every instance. The loss in weight might be expected to be greater on the sandblasted specimens, whether annealed or half-hard. Tests definitely show that sandblasting does promote corrosion, or accelerates it, even though passivation follows sandblasting. 6 ref.

6-22. **An Alternate Immersion Test for Aluminum-Copper Alloys.** R. B. Mears, C. J. Walton, and G. G. Eldredge. American Society for Testing Materials Preprint, No. 29, June '44, 15 pp.

A control test for some aluminum-copper alloys is described. This test consists of alternately immersing specimens of these alloys in a solution containing 57 g. of sodium chloride and 3 g. of hydrogen peroxide per liter at 30° C. A detailed description of the best procedure is given. The effect of several variables, such as concentration and volume of the solution, or change in thickness and heat treating conditions of the test specimens, on the test results is discussed. 6 ref.

6-23. **The Salt Spray Test.** V. M. Darsey. American Society for Testing Materials Bulletin, No. 128, May '44, pp. 31-34.

Salt spray test, operating conditions, relations between humidity and salt fog concentration.

6-24. **Refinery Corrosion Problems Reviewed.** Ivy M. Parker. *National Petroleum News,* v. 36, June 7, '44, pp. R-376, R-378.

Causes of corrosion from oil and water in refineries and natural gasoline plants are reviewed and principal points of attack described. Experiences are given in combating corrosive tendencies of three types of water in the plant cooling water system.

6-25. **Use of Nickel Alloys to Resist Corrosion.** B. B. Morton. *National Petroleum News,* v. 36, June 7, '44, pp. R-381, R-382.

Refinery corrosion is sharply controlled by temperature as to character and intensity. In general the character of attack changes with the presence or absence of liquid water. To protect against sulphur attack at high temperatures, in excess of 500° F., there must be increasing quantities of chromium in the alloy.

6-26. **Stress Corrosion of Cast Irons.** R. F. Hehemann, D. A. Shepard and L. Thomassen. *Metals & Alloys,* v. 19, May '44, pp. 1141-1144.

Data on resistance of cast irons to stress corrosion that might assist the equipment designer or materials engineer in appraising their suitabilities. Malleable iron castings possess unexpectedly good resistance to stress corrosion. 8 ref.

6-27. **Stress Corrosion Cracking of Mild and Stainless Steels.** James T. Waber Thesis for Ph.D. Degree in Metallurgy, Illinois Institute of Technology, 1944.

Evolves a general theory in which stress corrosion susceptibility is correlated with the ease of transformation from a metastable state, such as in age hardening. In the cracking of boiler plate steels, heat treatment and stress level were found to be interrelated, and remedial treatments also were studied. The mutual effects of the carbon, nitrogen, and aluminum contents were investigated. Effectiveness of a number of corroding solutions was evaluated and a number of the consequences of theory were verified with magnesium-base alloys.

6-28. **A Study of the Problems of Corrosion and Erosion of Distillers' Food and Feed Recovery Equipment.** Roland Arthur Kozlik. Thesis for Degree of M.S. in Metallurgical Engineering, University of Kentucky, June 1944.

6-29. **Man Against Oxygen.** R. G. Sloane. *Scientific American,* v. 171, July '44, pp. 22-24.

In the perpetual struggle to prevent oxygen from combining with man's best metals, such as iron, the petroleum corrosion preventives, now proved up in the war, are shouldering their way into wider use.

6-30. **The Corrosion of Aluminium Welds in Nitric Acid.** W. L. Hall and E. G. West. *Institute of Welding Transactions,* v. 7, March '44, pp. 30-37.

Samples cut from gas (oxy-acetylene) and metallic arc welds in super-purity and commercial-purity aluminum were exposed to the action of 70% and 37% nitric acid at room temperature and 37% acid at 60 to 70° C. The specimens were tested not only in the as-welded conditions, but also after cold hammering and after annealing with and without previous cold hammering. Welds made in super-purity aluminum using super-purity filler rods or 99.85% aluminum electrodes were attacked only slightly more severely than the parent metal. Welds in commercial-purity aluminum using filler rods or electrodes of the same composition were attacked preferentially to the basis plate.

6-31. **Mechanism of Electrolytic Oxidation of Aluminum.** Scott Anderson. *Journal of Applied Physics,* v. 15, June '44, pp. 477-480.

Proposes to show that the compact barrier layer separating the base of the pores from the aluminum is continuous, unbroken, and is the seat of the growth processes which result in the formation of the oxide coating. 4 ref.

6-32. **On the Destructive Action of Cavitation.** M. Kornfeld and L. Suvorov. *Journal of Applied Physics,* v. 15, June '44, pp. 495-506.

Historical survey, conception of the mechanism of the destructive action of cavities, the setting of the problem, experimental device and preliminary experiments, optical part of the experimental arrangement, radical and surface vibration of air bubbles, loss of stability of shape of vibrating air bubbles, cavities. 21 ref.

6-33. **Causes and Prevention of Boiler Priming & Solids Carryover.** W. H. Rowand. *Blast Furnace & Steel Plant,* v. 32, June '44, pp. 710, 712, 733-736.

Factors which cause the entrainment of boiler water, and its attendant salts, in the saturated stream leaving a boiler drum and what has been done to correct these conditions.

6-34. **Corrosion Fatigue.** A. U. Huddle and U. R. Evans. *Iron & Steel,* v. 17, May 18, '44, pp. 405-407.

Measurements made with a new feeding arrangement.

6-35. **Corrosion Research.** U. R. Evans. *Iron & Steel,* v. 17, May 18, '44, pp. 441-447.

Interim report of progress at Cambridge University. Wet corrosion; methods of protection; corrosion fatigue, oxidation, tarnishing and film-growth.

6-36. **Corrison Protection of Metals.** K. G. Compton. *Canadian Metals & Metallurgical Industries,* v. 7, July '44, pp. 27-28, 53.

Mechanism of corrosion process; natural and applied protective coatings; types of coatings; steel protection; aluminum alloys; marine corrosion.

6-37. **The Formulation of Anti-Corrosive Compositions for Ships' Bottoms and Underwater Service on Steel.** F. Fancutt and J. C. Hudson. Iron & Steel Institute, Advance Copy, June '44, 65 pp.

The effect of the pigment and medium; formulation and details of paints; physical properties and results of storage tests; details of painting the specimens; preparation and compositions of paints.

6-38. **Corrosion Resistance of Electrodeposited Lead.** John F. Beall. American Electroplaters' Society *Monthly Review,* v. 31, August '44, pp. 719-723.

Limited use of lead plating due to the lack of published data on the advisability of lead coatings and the fact that there was no satisfactory solution commercially available.

6-39. **Aluminum in the Chemical Industries.** *Light Metals,* v. 7, July '44, pp. 352-358.

Tests for determining corrosion resistance in service and a comprehensive survey of the effects upon aluminum of a wide range of inorganic chemicals commonly encountered in chemical engineering practice.

6-40. **Corrosion Testing of Water-Soluble Aluminum Cleaners.** Jay C. Harris. American Society for Testing Materials *Bulletin,* no. 129, August '44, pp. 21-29.

Literature survey; corrosion tests defined by government specifications; basis for corrosion test for water-soluble aluminum cleaners; metal preparation; test conditions; method of tests; expression of corrosion test results. 18 ref.

6-41. **Corrosion Prevention.** *Steel,* v. 115, Sept. 4, '44, p. 94.

Improved by new wrapping system that protects packaged steel parts. Highly finished steel surfaces are protected against most severe shipping conditions.

6-42. **Studies on Stress Corrosion Cracking of Austenitic Stainless Steels, Types 347 and 316.** M. A. Scheil and R.

A. Huseby. *Welding Journal,* v. 23, August '44, pp. 361-s-363-s.

To check the statement that 18-8 steels containing ferrite are much more resistant to cracking in boiling $CaCl_2$ solutions than the wholly austenitic alloys.

6-43. **The Mechanism of Failure of 18 Chromium—8 Nickel Cracking Still Tubes.** C. L. Clark and J. W. Freeman. American Society for Metals. 1944 Preprint No. 12, 28 pp.

Results obtained from metallurgical examination of 18% chromium, 8% nickel cracking still tubes which had been in service for time periods ranging up to 97,520 hr. It is believed that the deterioration, and possible actual failure of 18-8 cracking still tubes in service is due to structural changes at the grain boundaries which are progressive in nature and are dependent on time, temperature and stress.

6-44. **Corrosion Behavior of Magnesium Alloys.** H. M. Muncheryan. *Iron Age,* v. 154, Sept. 7, '44, pp. 68-72.

Inclusions of flux particles in magnesium alloy castings in the presence of an electrolyte establish a continuous chemical reaction that is disastrously corrosive. Inclusions can be prevented by careful foundry procedure. They may also be detected and repaired prior to the installation of castings in service.

6-45. **The Protective Influence of Manganese in the Corrosion of Aluminum-Containing Magnesium Alloys.** F. A. Fox and C. J. Bushrod. Institute of Metals *Journal,* v. 70, July '44, pp. 325-338.

Corrosion tests have been carried out on magnesium-base aluminum-containing alloys carrying varying manganese contents and, in one alloy to D.T.D. specification 325, varying iron contents. The corrosion rates obtained are compared with those reported in the American work. The results of these exploratory experiments indicate that the presence of an amount of manganese in excess of a certain critical limit is able to offset the accelerating influence of iron contamination on the corrosion rates of these alloys; in other words, the iron:manganese ratio seems to be a controlling factor. 9 ref.

6-46. **Repairing a Cast-Iron Valve.** Galen F. Biery. *Welding Engineer,* v. 29, Sept. '44, p. 45.

Pitting effects of corrosion were overcome by combining arc welding and metallizing on a large cast iron, bronze-seated relief valve.

6-47. **Cracking and Embrittlement in Boilers.** H. N. Boetcher. *Mechanical Engineering,* v. 66, Sept. '44, pp. 593-601.

Lists and describes, for identification, the characteristics of the principal types of cracks, cracklike penetrations, and embrittlement found in pressure parts of boilers, with particular emphasis on caustic cracking and a recently discovered type of cracks in high-pressure boilers.

6-48. **Acid-Resisting Metal.** *Iron & Steel,* v. 17, August '44, p. 563.

Three-ton castings in high silicon iron.

6-49. **Atmospheric Corrosion of Elektron AZM.** J. Crowther. *Magnesium Review,* v. 4, April '44, pp. 45-50.

Atmospheric corrosion of a wrought magnesium-base alloy (Elektron AZM) as assessed by the measurement of mechanical properties after exposure for varying periods. 1 ref.

6-50. **Effects of Oxygen Exhaustion From Corrosive Solutions on High Nickel-Chromium-Molybdenum Alloy Steels.** W. E. Pratt. Electrochemical Society Preprint 86-5, 78 pp.

Procedures employed in discovering the causes of failures and the methods adopted for correcting unusual corrosive conditions of stainless steel alloys described.

6-51. **The Protective Influence of Manganese in the Corrosion of Aluminum-Containing Magnesium Alloys.** F. A. Fox and C. J. Rushrod. *Metallurgia,* v. 30, August '44, pp. 195-196.

High-purity magnesium-base alloys, particularly those of low iron content, are much more resistant to the attack of sodium chloride solution than are commercial alloys of normal purity. It is shown that the presence of an amount of manganese in excess of a certain critical limit is able to offset the accelerating influence of iron contamination on the corrosion rate of these alloys. 9 ref.

6-52. **Corrosion Resistance of Steel.** R. M. Thomas. *Steel,* v. 115, Oct. 2, '44, pp. 74, 76, 78, 118, 120, 122, 124.

Extended through chemical treatment of electroplated zinc, cadmium and galvanized surfaces in bichromate salt bath. Method also can be applied to die castings.

6-53. **Corrosion Ratings of Metals.** *Iron Age,* v. 154, Oct. 5, '44, pp. 59-62.

Summarized corrosion data on ferrous and non-ferrous metals.

6-54. **Effect of Combined High Temperature and High Humidity on the Corrosion of Samples of Various Metals.** W. L. Maucher and B. W. Jones. American Society of Mechanical Engineers *Transactions,* v. 66, Oct. '44, pp. 624-632.

The atmosphere around and in oil refineries is corrosive, and when these refineries are located in hot humid locations, this atmosphere attacks various metals actively. Four groups of 18 selected metal specimens were subjected to this corrosive atmosphere in a refinery along the Gulf Coast. Two groups were located indoors and two groups outdoors for about one year.

6-55. **Chromate Passivation of Zinc and Cadmium Surfaces.** Frank Taylor. *Metallurgia,* v. 30, Sept. '44, pp. 275-276.

Many parts of service equipment possessing zinc or cadmium surfaces are given a passivation treatment

to increase their resistance to corrosion. The method in which chromates are applied.

6-56. **Corrosion of Yellow Brass Pipes in Domestic Hot-Water Systems—A Metallographic Study.** E. P. Polushkin and Henry L. Shuldener. *Metals Technology,* v. 11, Oct. '44, T. P. 1742.

Microscopic examination of a series of brass pipes removed from apartment and office buildings. Brief history of the pipes, a description of their inside surface and microstructure, and a study of the effects of corrosion, with particular reference to the structural aspects of local and selective dezincification. 21 ref.

6-57. **Cylinder-Bore Wear.** *Automobile Engineer,* v. 34, Oct. '44, pp. 409-410.

An analysis of the factors causing corrosion.

6-58. **Stress-Corrosion Tests of Bridge-Cable Wire.** Rolla E. Pollard. *Journal of Research, National Bureau of Standards,* v. 33, Nov. '44, pp. 201-211.

Stress-corrosion cracks were produced in several statically stressed specimens of cold-drawn wire from the Portsmouth Bridge and in one specimen of heat treated wire from the Mt. Hope Bridge by immersion in dilute nitrate solutions. No cracks were produced in the cold-drawn Mt. Hope replacement wire after long exposure. 12 ref.

6-59. **Practical Precautions for Preventing Concentration Cell Corrosion.** *Steel,* v. 115, Nov. 13, '44, p. 136.

Observing several simple practices will avoid a rapid and destructive attack which takes place in crevices, beneath scale, and other deposits.

6-60. **Corrosion of Stainless Steel in the Synthesis of Urea.** A. I. Krasil'shchikov. *Korrozia i Bor'ba s Ne.,* v. 6, no. 5-6, 1940, pp. 26-31. *Khim. Referat. Zhur.,* v. 4, no. 7-8, 1941, pp. 132-3. *Alloy Metals Review,* v. 3, June '44, p. 2.

Under conditions of $(NH_2)_2CO$ synthesis the presence of excessive moisture in the mixture and an increase in the temperature of the mixture increases sharply the corrosion of steel EI-183 (Cr 18, Ni 8 and Mo 4%). Addition of excess NH_3 to the mixture retards the corrosion of this steel. NH_4CNO, which is always in equilibrium with $(NH_2)_2CO$ in the mixture, is considered to be the chief aggressive substance in the synthesis of $(NH_2)_2CO$. Test of various materials indicated that for lining the synthesis column the steel EI-183 is best. The pipes can be made of steel containing Cr 18%, Ni 14%, and Mo 4% and the intermediate part of the apparatus not exposed to high pressures can be made of Chromex. Addition of 0.3 to 0.5% of CuO to the charge decreased considerably the corrosion of steel EI-183.

6-61. **Special Corrosion Problems in Aircraft.** W. E. Donaldson. *Mechanical Engineering,* v. 66, Dec. '44, pp. 799-800.

Corrosion caused by direct chemical action, by dissimilar metal contact; concentrated corrosion cells;

means of preventing corrosion; other corrosion problems.

6-62. **Rust Identification.** Ralph O. Clark. *Iron & Steel,* v. 17, Nov. '44, p. 679.

Testing surface deposits on iron and steel. 1 ref.

6-63. **Metallic Corrosion.** U. R. Evans. *Iron & Steel,* v. 17, Nov. '44, pp. 686-690.

Mechanism and methods of inhibition or prevention. 16 ref.

6-64. **Ammonia and Mercury Stress-Cracking Tests for Brass.** Gerald Edmunds, E. A. Anderson, and R. K. Waring. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 1, Nov. '44, 12 pp.

Stress corrosion test developed in which small brass specimens were externally stressed in tension while exposed to an atmosphere. The measure of the susceptibility of the specimen to stress corrosion is the time required for the specimen to break under the applied tensile strength. Time required for failure is a function of the applied stress. 6 ref.

6-65. **The Role of Smokeless Powder in the Season Cracking of Small Arms Ammunition.** J. W. Mitchell. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 4, Nov. '44, 9 pp.

Cracking tendency of ammonium salts and smokeless powder on two different lots of caliber 0.30 cartridge cases was found to differ in ratio with the stress level in these cases as measured by the mercury-cracking test. Stress-relief anneal of the cartridge case at 475° F. for 45 minutes reduced the severity of cracking considerably, although the number of internal cracks, that is, ones which do not penetrate completely to the exterior, was not greatly reduced. 2 ref.

6-66. **Residual Stress in Caliber 0.30 Cartridge Cases.** H. Rosenthal and J. Mazia. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 7, Nov. '44, 14 pp.

Investigation of residual stress in the head and body of caliber 0.30 cartridge cases. The head was divided into four ring-like sections which were cut off by a jeweler's saw. Spring-out was measured after a radial cut had relieved the circumferential bending moment. The residual stress corresponding to the observed spring-out was calculated by formulas in which the computed stress was a function of wall thickness. 6 ref.

6-67. **Symposium on Stress-Corrosion Cracking, Introduction.** E. H. Dix, Jr. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 9, Nov. '44, 4 pp.

Spontaneous cracking which results from the com-

bined effect of high, prolonged stress, and corrosive attack.

6-68. **Factors Influencing the Stress Cracking of Brass Cartridge Cases.** George Sachs, George Espey, and S. M. Clark. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 13, Nov. '44, 21 pp.

Tendency of a commercially drawn cartridge case to crack in the mercury test and the relation of cracking tendency to residual stress retained after drawing studied; effect of a number of processing (drawing) variables on the cracking tendency investigated. 19 ref.

6-69. **Test Methods and Progress in the Stress-Corrosion Investigation at Wright Field.** Baxter C. Madden, Jr. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 14, Nov. '44, 22 pp.

Stress corrosion defined and certain examples illustrated. Test methods, to determine the resistance of materials to stress corrosion, being developed at Wright Field. The criterion as to validity of a method is stated. 22 ref.

6-70. **The Assessment of the Susceptibility of Aluminum Alloys to Stress Corrosion.** F. A. Champion. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 17, Nov. '44, 14 pp.

On exposing aluminum alloys to corrosive conditions with or without stress there may be an induction period during which no measurable loss of mechanical properties occurs. When measurable corrosion starts it follows an exponential law; it is not necessary to continue the tests to destruction in order to estimate the ultimate loss of strength. 13 ref.

6-71. **Discussion of Stress-Corrosion Testing Methods and Results.** Hiram Brown. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 18, Nov. '44, 4 pp.

Chemical composition and inherent corrosion resistance of the material have an important effect on the resistance to stress corrosion.

6-72. **A Generalized Theory of Stress Corrosion of Alloys.** R. B. Mears, R. H. Brown and E. H. Dix, Jr. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 20, Nov. '44, 17 pp.

Causes of localized attack; electrochemical measurements between grains and grain boundaries; effect of stress; nature of the stress; directional effects; stress relief; other studies supporting the electro-chemical theory; stress-corrosion cracking of plastics. 12 ref.

6-73. **Some Observations of Stress-Corrosion Cracking in Austenitic Stainless Alloys.** M. A. Scheil. American

Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 22, Nov. '44, 16 pp.

Austenitic stainless alloys are susceptible to stress-corrosion cracking which may occur under certain environments irrespective of their susceptibility to intergranular corrosion. Stressed specimens of stainless alloys included in a corrosion testing program will aid in determining the acceptability of these fabricated alloys, when stressed, to the service conditions. 5 ref.

6-74. **The Susceptibility of Austenitic Stainless Steels to Stress-Corrosion Cracking.** Russell Franks, W. O. Binder and Charles M. Brown. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 23, Nov. '44, 10 pp.

Corroding media examined from the standpoint of promoting susceptibility to stress-corrosion cracking in the annealed and cold-rolled austenitic chromium-nickel steels; only a few of the corrodents have been found to cause this type of failure. The corrosive media that most readily produce stress-corrosion cracking are listed. 4 ref.

6-75. **Stress-Corrosion Tests of Bridge-Cable Wire.** R. E. Pollard. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 25, Nov. '44, 16 pp.

Static stress-corrosion tests on samples of cold-drawn Portsmouth bridge-cable wire and on a few samples of heat-treated Mt. Hope bridge-cable wire and the cold-drawn wire used in the replacement cables of the Mt. Hope bridge. 11 ref.

6-76. **A Study of the Surface Film on Chromium-Nickel (18-8) Stainless Steel.** W. H. J. Vernon, F. Wormwell, and T. J. Nurse. Iron & Steel Institute, advance copy, Oct. '44, 12 pp.

Thickness of the film as measured by total oxides present (Cr_2O_3, Fe_2O_3, NiO) increases with the degree of polish. There is a marked enrichment of chromium in the film as compared with the underlying steel, and this enrichment also increases with the degree of polish. Films from brightly polished specimens contain about 90% of chromic oxide, the balance being mostly ferric oxide. No enrichment of nickel has been observed. The use of chromic oxide as a final polishing material does not appreciably affect the content of chromic oxide in the film. When alumina is used for the final polishing this substance is introduced into the film and the concentration of chromic oxide is simultaneously reduced.

6-77. **Corrosion of Galvanized Coatings and Zinc by Waters Containing Free Carbon Dioxide.** L. Kenworthy and Myriam D. Smith. Institute of Metals *Journal*, v. 70, Oct. '44, pp. 463-489.

Investigation of one of the controlling factors of corrosion of such tanks, namely, the free carbon dioxide content of the water. Increase in free carbon dioxide content increases the attack in all cases. Importance of

gas bubbles in initiating pitting in hot tanks discussed. Recommendations are made with regard to the type and thickness of coatings, as well as the treatment of water supplies. 11 ref.

6-78. **Metal Corrosion and Its Prevention.** Raymond R. Rodgers. *Canadian Metals & Metallurgical Industries,* v. 7, Dec. '44, pp. 20-22, 25.

Principal methods of protection and pre-treatment.

SECTION VII

PROTECTION

7-1. **Surface Treatments for Magnesium, Pt. 2.** E. R. Holman and J. P. ApRoberts. *Metals and Alloys,* v. 18, no. 6, Dec. '43, pp. 1331-1334.

Chemical processes, plating procedure and organic coatings.

7-2. **Diffusion in Chromizing.** I. R. Kramer. *Metals Technology,* v. 11, no. 1, Jan. '44, Abst.

Corrosion resistance of the chromized layer is high, and these steels offer some advantages over other corrosion-resisting coatings or alloys. Chromizing process uses soft or low alloyed steels that can be easily hot or cold formed and since the chromized layer is soft and adherent, these parts can be subjected to cold deformation without spalling or chipping.

7-3. **Finish-O-Phobia. III.** Paul O. Blackmore. *Die Casting,* v. 3, no. 1, Jan. '44, pp. 38-42.

Primers, though covered by a finishing coat, are vitally important. Users and formulators need to take into account characteristics of both the priming coat and the metal to which it is applied.

7-4. **Jigs and Tools for Anodising.** G. O. Taylor. *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 7-10.

Designs for jigs and tools are described that can with advantage be added to the equipment of an anodic oxidation plant to speed up production and reduce labor and material costs.

7-5. **Winning the War on Wear.** John A. Gallaher. *Welding Engineer,* v. 29, no. 1, Jan. '44, pp. 45-49.

Hard facing permits use of equipment in service despite abrasion, corrosion, heat, impact and thermal shock.

7-6. **Some Considerations in the Choice of Hard-Facing Metals.** Jim Medford. *Petroleum World,* v. 41, no. 1, Jan. '44, pp. 42-45.

Hard-facing alloys require more than mere hardness to be wear resistant. Prolonged research has taught Stoody engineers what characteristics are required and why.

7-7. **Anodic Films on Aluminum Alloy Parts on German Aircraft.** *Foundry Trade Journal,* v. 71, no. 1427, Dec. 23, '43, p. 329.

Anodic treatment of aluminum aircraft parts in Ger-

many has been described in an article in *Dornier Post.* The conditions of operation are 15 to 20 amp. per sq. ft., 11 to 22 volts, 16 to 24° C., and sulphate of aluminium content of bath not greater than 45 grams per liter. Hot potassium dichromate solution (90 to 95° C.) is used to seal the films.

7-8. **Anodic Films.** *Aircraft Production,* v. 6, no. 63, Jan. '44, p. 48.

An examination of aluminum alloy parts from German aircraft.

7-9. **Hard-Facing in the War on Wear.** John A. Gallaher. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 16-24.

Properties of the various hard-facing alloys and the kind of wear that each type of alloy can best combat. Selection of the hard-facing material, selection of the base material, preparation of the part for hard-facing and application of the hard-facing material.

7-10. **Tinning of Light Metals by Means of Ultrasound.** A. E. Thiemann. *Engineers' Digest,* v. 1, no. 1, Jan. '44, p. 38.

A new process consists in dipping the aluminum sheet into a bath of molten tin, at the same time contacting the sheet with an ultrasound generator. The ultrasound vibrations transmitted to the aluminum sheet in this way are in turn transmitted to the tin film surrounding the sheet. The enormous accelerations and decelerations hereby imparted to the tin particles serve to remove the adherent layer of oxide, its place being taken by a layer of tin intimately bonded with the virgin aluminum surface.

7-11. **Metallizing.** Norman Clarke Jones. *Society of Chemical Industry,* v. 62, no. 51, Dec. 18, '43, pp. 481-482.

Spraying molten metal onto worn machine parts; Metallizing is carried out by means of a portable gun, which can be held and operated by hand, or secured in the tool post of a lathe.

7-12. **Procedures for Testing Metallizing Bond.** H. Ingham and K. Wilson. *Iron Age,* v. 153, no. 4, Jan. 27, '44, pp. 44-49.

In an effort to standardize testing methods for the adherence strength of sprayed metals, the authors have worked out two procedures: One is a test for shear strength, the other for tensile strength, since both shear and tension affect bond strength.

7-13. **Anodic Films on German Aluminum Alloys.** *Iron Age,* v. 153, no. 6, Feb. 10, '44, p. 58.

Samples of anodically treated Al alloy parts from German aircraft examined. Scratch and bend tests showed the films were adherent. Results of chemical tests given.

7-14. **Light Alloys: Anodizing Aluminum Castings.** *Light Metal Age,* v. 2, Jan. '44, pp. 23, 26, 29.

Anodizing of aluminum-silicon alloys in the die-cast state.

7-15. **Electrostatic Fields.** G. W. Birdsall. *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 128-129, 168-169.

Aids metal finishing by producing more uniform

coat in spraying and dipping operations and by cutting loss from overspray.

7-16. **Plastic Dipping for Export Shipment.** Harry Forsberg. *Iron Age,* v. 153, no. 5, Feb. 3, '44, pp. 54-55.

All types of machine parts may be dipped in ethylcellulose plastic, which affords complete protection to the point of delivery. The coating is transparent and may be stripped off with complete ease.

7-17. **Metallizing Practice.** G. C. Close. *Western Metals,* v. 2, Feb. '44, pp. 7-12.

Applications of metallizing; metallizable elements; use as protective coating; use on non-metallic materials; simplicity; surface preparation methods; distance of gun; thickness of coatings.

7-18. **Magnesium-Base Alloys: Practical Value of Protective Treatments.** C. J. Bushrod. *Magnesium Review and Abstracts,* v. 3, Oct. '43, pp. 114-119.

Corrosion of magnesium-base alloys by salt solutions; atmospheric corrosion of magnesium-base alloys; protective schemes. 14 ref.

7-19. **Skinning the Dry-Type Spray Booth.** Robert Holder. *Products Finishing,* v. 8, Feb. '44, pp. 20-28.

Advantages and disadvantages of various methods of cleaning dry-type spray booths are presented; author indorses the special spray booth coatings recommended by the manufacturers of spray booths and supplies. Several coatings are named and discussed.

7-20. **Some Practical Facts About the By-Products Formed in Different Fields of Hot-Dip Galvanizing.** Wallace G. Imhoff. *Wire & Wire Products,* v. 19, no. 2, Feb. '44, pp. 115-117.

Percentage total by-products made in each field of galvanizing.

7-21. **Metal Plating of Plastics.** *Canadian Metals & Metallurgical Industries,* v. 7, Feb. '44, pp. 33-34.

Methods and applications.

7-22. **Supplemental Protection for Black-Oxide Finishes.** Mark Weisberg and Edward A. Parker. *Steel,* v. 114, Feb. 28, '44, pp. 109, 136.

Salt-spray tests on various supplemental coatings applied over black-oxide finishes show an extremely wide variation in additional protection afforded. All black-oxide coatings are less than 0.0002 in. thick and are slightly porous. Thus, for most uses, other than very mild indoor environment, it is necessary to use supplemental coatings such as oils, greases, waxes, lacquers or paint.

7-23. **Control of Fine Finished Surfaces.** J. Ferdinand Kayser. *Aircraft Engineering,* v. 16, Jan. '44, pp. 25, 28.

Method of measuring and controlling certain types of surface finishes by microscopes.

7-24. **Galvanising and Corrugating Sheet Metal.** H. W. Dickinson. *Engineering,* v. 157, Jan. 21, '44, p. 46.

Origins of the galvanising and corrugating processes applied to sheet metal.

7-25. **Rapid Anodizing and Painting of Aircraft Parts.** Herbert Chase. *Metals and Alloys,* v. 19, Feb. '44, pp. 342-345.

Handling equipment, anodizing, spray-painting.

7-26. **Decorative Anodizing for Post-War Products.** G. O. Taylor. *Metallurgia,* v. 29, Jan. '44, pp. 121-125.

Under present conditions aluminum alloy products are usually given a utilitarian finish, but the time may come when advantage can be taken of the many attractive finishes, in a large range of colors and tones, which are obtainable by anodizing, suitable for harmonizing, or contrasting with any decorative scheme.

7-27. **Hard Layers on Toolsteels.** James P. Gill. *Metal Progress,* v. 45, March '44, pp. 488-490.

Chromium plating, nitriding, carburizing of toolsteels.

7-28. **Re-Galvanizing of Welded Joints.** *Iron Age,* v. 153, March 16, '44, pp. 66-67.

Successfully re-galvanizing on the job with an alloy called "Galv-Weld" to prevent corrosion can be applied to seams made by arc and gas welding. Applications in shipbuilding.

7-29. **Production Phases of Hot Dip Galvanizing.** Wallace G. Imhoff. *Steel,* v. 114, March 13, '44, pp. 110-112.

Heat from bath; higher temperature required with increased production, flux carry over.

7-30. **Stretching the Life of a Nail Machine Crankshaft Through Metal Spraying.** Jess Copp. *Wire & Wire Products,* v. 19, March '44, pp. 176-177, 196-197.

Maintenance has played an important role in keeping war machines in operation. How Metallizing is keeping nail mills going described.

7-31. **Black Oxide Coatings on Stainless Steels.** Irvine Clingan. *Metal Finishing,* v. 42, March '44, pp. 139-140.

Surface blackening stainless steels by treatment in molten dichromate at temperatures in excess of 615° F. The resulting black coating possesses a high degree of strength and elasticity, shows good resistance to wear and abrasion, improves the corrosion resistance of the parent metal in various corrosive media, does not produce any dimensional change in the treated part, and the color is permanent. 2 ref.

7-32. **Colored Finishes.** Marc. Darrin and L. G. Tubbs. *Metal Finishing,* v. 42, March '44, pp. 141-144.

Colored finishes may be readily obtained on chromic acid anodized Al and its alloys, in much the same manner as black finishes. The procedure may be modified to produce almost any desired color. This report describes how these colored finishes—red, yellow, green, blue—are obtained and the effect of some variations in procedure. Results obtained with a number of dyes. Instructions for some typical finishes on commercially pure Al and several of its alloys. 6 ref.

7-33. **Surface Finish.** W. E. R. Clay. *Automobile Engineer,* v. 34, Feb. '44, pp. 73-78.

Review of the various processes including measurement.

7-34. **Tin Plating.** *Products Finishing*, v. 8, March '44, pp. 20-22, 24-28.

History and development of tin as a coating agent. Black plate, hot-dipping, electrotinning, electrolytic lines, finishing.

7-35. **Methods of Evaluating Metal Finishes.** Jeffrey R. Stewart. *Products Finishing*, v. 8, March '44, pp. 36-37, 39-40, 42.

During wartime, methods of evaluating protective coatings for metals are changed or improved so rapidly that magazine articles must supplement previously printed texts. Up-to-date information on several important tests recently developed or improved and now in wide use.

7-36. **Successful Hard-Facing of Dies Depends Upon Proper Alloy.** *Tool & Die Journal*, v. 9, March '44, pp. 95-98.

Punches for hot operations such as shell piercing can be protected by facing at low cost with an arc-welded deposit of a well-known nickel-base alloy.

7-37. **The Protection of Magnesium-Base Alloys.** A. W. F. Thynne. *Paint Technology*, v. 8, Nov. '43, pp. 171-173.

Why paint adhesion is poor, the pigment, the medium, the complete paint system.

7-38. **Rust-Proofing.** *Automobile Engineer*, v. 34, March '44, pp. 109-110.

Prevention of corrosion by the use of non-metallic phosphate coatings. Parkerizing process developed by the Pyrene Company, Ltd. for rust-proofing iron, steel and zinc.

7-39. **Coating Magnesium Alloys.** Ernest J. Gruen. *Light Metal Age*, v. 2, March '44, pp. 14-16, 32.

Recommended methods for selecting and applying various types of coatings to prevent corrosion of magnesium alloys. Discussed are impurities, surface cleaning, dichromate, seal chrome pickle, chrome sulphate, H. F. alkaline dichromate, alum dichromate, selenic, anodic, fluoridic, sodium hydroxide and painting treatments. 27 ref.

7-40. **Bonding of Steel and Aluminum.** Marshall G. Whitfield and Victor Sheshunoff. *Aero Digest*, v. 44, March 1, '44, pp. 86, 88, 222, 224.

A new aluminum-to-steel chemical bond, known as the "A1-Fin" process. It makes possible marked reduction in the structural weight of an air-cooled engine and greatly improves the cooling efficiency of its cylinders.

7-41. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas*, v. 22, April '44, pp. 25, 43-48.

Discussion of fuels from viewpoint of heating hot-dip galvanizing furnaces: Gas fuel.

7-42. **Salvage by Electrodeposition.** Harold Narcus. *Metal Finishing*, v. 42, April '44, pp. 200-202, 207.

Salvage using "hard" or industrial chromium deposits; salvage using heavy nickel deposits; salvage using iron deposits.

7-43. **Lockheed Requirements for Protective Coatings.** Maxwell Stiles. *Industrial Finishing,* v. 20, March '44, pp. 18, 22, 24, 28, 30, 32, 38.

Zinc chromate primer; its purpose and proper thickness. Protective coatings for interior surfaces. For exterior surfaces; customer's specifications. Treatment of surfaces at joints and seams. Insulation to prevent direct contact of dissimilar metals. Surface treatment of aluminum and aluminum alloys. Anodic treatment for aluminum alloys. Treatment of magnesium. Acid, alkali-resisting paint. Protective coatings for cables and fittings; compartments. For junction boxes; liquid lines and tubing.

7-44. **Worn Machine Tools Reclaimed by Metallizing.** *Western Metals,* v. 2, April '44, p. 27.

Reclaiming worn machine tools and other moving parts receiving exceptional wear that are necessary to the production of warplanes with metal spray.

7-45. **Republic Uses Pentrating Process.** *Iron Age,* v. 153, April 13, '44, p. 65.

Pentrating is a salt-mixture controlled oxidation process applied to ferrous metals. The lustrous black finish which results adds to the durability of the metal surface and has marked anti-friction and anti-rust qualities.

7-46. **Protectively Coating Fruehauf Trailers.** Fred Boynton. *Industrial Finishing,* v. 20, April '44, pp. 28-30, 32, 34.

Protective coatings essential, thorough metal cleaning, red oxide primer plus lusterless paint, cleaning and painting parts before assembly.

7-47. **Water Thinned Primer Used in Aircraft Work.** Maxwell Stiles. *Industrial Finishing,* v. 20, April '44, pp. 46, 48, 50.

To save strategic materials, water-thinned zinc chromate and other coatings have been developed to the point where they can be used effectively in regular aircraft finishing.

7-48. **Spraying Molten Metal.** Francis A. Westbrook. *Printing Equipment,* v. 67, April '44, pp. 14-16.

Provides means for restoring worn or damaged machine parts to original size. Technique described.

7-49. **Phenolic Resin Baking Finishes for Protection Against Corrosion.** R. L. Norum. *Chemical Industries,* v. 54, April '44, pp. 524-528.

In the fight against chemical corrosion, resin baking finishes are finding increased application in the chemical process industries. Their service characteristics, where and how they may be used, and some typical applications are described.

7-50. **Magnesium Alloys Surface Treatment and Corrosion.** S. H. Phillips. *Western Metals,* v. 2, May '44, pp. 19-20, 23-24.

The performance and applications of the present surface treatments commonly used as base protective finishes.

7-51. **Metal Finishes at War.** Burr Price. *Products Finishing,* v. 8, May '44, pp. 24-26, 28, 30, 32, 34, 36.

Metal finishes in battle; paint and air power; marine painting is never finished; on the home front; manufacture and supply; new materials and methods.

7-52. **The Theory and Use of Zinc Chromate Primers.** Paul O. Blackmore. *Industrial Finishing,* v. 20, May '44, pp. 24, 26, 28, 30, 32, 34, 36, 38.

Why zinc chromate primer is used; how it protects the surfaces of metal from corrosion; how to use it to get best results; what tests and precautions to observe when you are using it.

7-53. **Non-Rusting Tinplate.** R. Kerr. *Tin & Its Uses,* No. 15, March '44, p. 16.

A new rust-preventing process that will be of great value to the tinplate industries.

7-54. **Uses of Clad Steels to Combat Corrosion.** Martin J. Conway. *National Petroleum News,* v. 36, June 7, '44, pp. R-378, R-381.

Type of clad steels in which nickel, copper and their alloys are bonded to steel base plate. Clad steels can be fabricated in the plant shop with reasonable care and supervision. Procedure for welding these types of steels is described.

7-55. **Measurement of Thickness of Fired-On Gold Coatings.** K. H. Ballard. *Metal Finishing,* v. 42, June '44, pp. 342-343.

A jet-test method for measuring the thickness of liquid bright and burnish gold coatings on ceramics and two independent standardization methods for determining the stripping factors of the ammonium iodide-iodine-hydrochloric acid-Gardinol reagents. The method would be applicable to thickness measurements of ceramic coatings of gold alloys, but a stripping factor for each particular alloy would have to be ascertained. The method is rapid and with reasonable care should be accurate to $\pm$ 6%. 5 ref.

7-56. **Metal Finishing at Nash-Kelvinator.** Bryant W. Pocock. *Products Finishing,* v. 8, June '44, pp. 42-44, 46, 48, 50, 52, 54, 58.

Putting final touches on parts for the well-known Hamilton Standard propeller is a far cry from this company's peacetime pursuit of manufacturing automobiles and electric refrigerators. 2 ref.

7-57. **Maintenance Repairs Facilitated by Metal Spray Process.** Francis A. Westbrook. *Industry & Power,* v. 46, June '44, pp. 65, 93.

Eastern States Cooperative Milling Corp. utilizes metallizing process chiefly for building up shafting—saves time, labor, and materials.

7-58. **Hard-Surfacing Applications and Techniques.** *Society of Automotive Engineers Journal,* v. 52, June '44, pp. 25-32.

Equipment required, magnaflux test, oxy-acetylene process, electric process, selection of hard-surfacing rod, operator training, costs of hard-surfacing, automotive parts regularly hard-faced, machine parts in

maintenance shops, tractor drive sprockets, tractor track rails, tractor idler wheels, tractor track rollers, tractor grousers, bulldozer tips, dipper fronts, shovel-driving tumblers, shovel teeth, shovel crawler pads, carry-all blades, sheepsfoot tampers, grader blades.

7-59. **Galvanizing Industry Will Be Challenged by Substitutes in the Post-War Period.** Nelson E. Cook. *Metals,* v. 14, May '44, pp. 8-11.

Wonderful merits being claimed for new products but these will have to be proved. Zinc coated products will meet challenge.

7-60. **Choosing the Right Material—VII.** H. W. Gillett. *Machine Design,* v. 16, June '44, pp. 123-128.

Use of clad metals is expanding; possibilities for high temperature service; thick lead coatings offer protection; machinability is important factor; manganese is promising alloy; stainless has noteworthy fatigue properties; substitute for copper band; process can spoil best material; unnecessary requirements restrict alternatives. 8 ref.

7-61. **Copper in Galvanizing Zincs and Galvanizing Baths.** Wallace G. Imhoff. *Wire & Wire Products,* v. 19, June '44, pp. 353-357, 390.

Copper content of galvanizing bath is harmful or beneficial, depending on amount present.

7-62. **Rod and Wire Coatings in the Cleaning House.** Floyd M. Hauger. *Wire & Wire Products,* v. 19, June '44, pp. 358-361, 390.

Discusses properties required in compounding a lubricant, film strength, solubility, melting point and particle size.

7-63. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas,* v. 22, June '44, pp. 17-18, 39-42, 44.

Discussion of fuels from viewpoint of heating hot-dip galvanizing furnaces: Oil fuel.

7-64. **"Keep 'Em Sailing!"** Charles Bolton. *Welding Engineer,* v. 29, June '44, pp. 50-51.

"Tasco" saves dollars and days by using the metallizing process to build up worn parts, correct errors made in machining and restore galvanized coating. In one year, over 72 miles of zinc wire were atomized and sprayed.

7-65. **Repairing Damaged Areas in Galvanized Coatings.** F. D. McBride. *Steel,* v. 114, June 12, '44, pp. 106, 109, 152, 154.

Making effective repairs without resorting to redipping the entire piece. For a suitable repair material, it is necessary to find one which remains positive electrochemically with respect to iron and steel but at the same time has a melting point lower than that of pure Zn. The composition must also retain its protective ability for a long period and it must be inexpensive.

7-66. **Production Metallizing.** H. E. Linsley. *Steel,* v. 114, June 19, '44, pp. 92, 132, 134.

Completely automatic system applies coating of

aluminum to steel aircraft cylinders at rate of one every 75 sec.

7-67. **The Theory and Use of Zinc Chromate Primers.** Paul O. Blackmore. *Industrial Finishing,* v. 20, June '44, pp. 38, 40, 42, 44, 46, 48, 52, 54, 59.

What primers are made of, why used, and how to select; control and use to get the best results; what makes a primer adhere firmly and permanently to metal, and how it protects metal surfaces from destructive corrosion.

7-68. **Bonderizing.** *Automobile Engineer,* v. 34, May '44, pp. 191-193.

Manner in which a non-metallic phosphate coating is formed and immersion Bonderizing and Spra-Bonderizing. Comparative tests with a view to evaluating the process.

7-69. **New Process for Corrosion-Proofing Steel Sheets.** O. E. Brown. *Steel,* v. 115, July 10, '44, pp. 90, 92.

Thermo-chemical treatment for mild steel sheet or strip stock held capable of giving protection against corrosion for protracted periods in storage or during processing. Material coated may be drawn, spun or shaped without harming surface.

7-70. **Precoated Metal Strip.** R. L. Hartford. *Steel,* v. 115, July 17, '44, pp. 132, 188.

Steel and other materials in coil form are finished prior to fabrication by new method, eliminating need for final finishing and minimizing handling requirements.

7-71. **Tinning of Light Metals by Means of Ultrasound.** *Light Metals,* v. 7, June '44, pp. 263, 264.

Theory and practice of the application of supersonics to facilitate tinning of aluminum.

7-72. **Electrogalvanizing of Strip Steel.** Ernest H. Lyons. *Canadian Metals & Metallurgical Industries,* v. 7, July '44, pp. 36-38, 47.

Preparation, processing, properties and tests. 34 ref.

7-73. **Flow Coating Padlocks in Electrostatic Zone.** Byron Morrill. *Industrial Finishing,* v. 20, July '44, pp. 22, 23, 24, 26, 42.

Coating problem for ordinary shaped padlock made of a zinc die casting, which has a superior type mechanism requiring close tolerance.

7-74. **Zinc Surfaces Will Hold Paint.** H. E. Van Siclen. *Industrial Finishing,* v. 20, July '44, pp. 52, 56, 58, 63, 64, 66.

Detailed results of different treatments worked out to make paint adhere to various zinc coated surfaces; also to other metals. Tests included bending and real outside exposure for different periods of time.

7-75. **The New Hot Dip Lead Alloy Coating Technique.** *Modern Industrial Press,* v. 6, July 44, p. 20.

New alloy and flux developments, as well as improved technique of application, now point the way to wide use of low tin content alloy coatings to render metal products corrosion resistant.

7-76. **Metal Treatment and Spray Painting at Lockheed.** Fred M. Burt. *Products Finishing,* v. 8, August '44, pp. 24-26, 28, 30, 32, 34, 36.

A fully mechanized process for handling large quantity, quick production in a very efficient manner.

7-77. **Spray Painting Pointers for Industrial Engineers.** James A. Bede. *Products Finishing,* v. 8, August '44, pp. 58-60, 62, 64.

Objective in spray painting; factors in obtaining balanced atomization; preparation of material; rate of material flow; atomization adjustment; gun stroking; variation and balancing of interrelated factors; selection of material feeds; handling in spraying.

7-78. **Protective Coatings for Aircraft Parts.** *Iron Age,* v. 154, August 17, '44, pp. 72-73, 184.

Parkerizing and Bonderizing to protect iron and steel parts and anodizing and chromodizing for aluminum. Steps employed to impart corrosion resistance to aircraft components.

7-79. **Influence of the Carbon Content of Steel Sheets on Their Ability to Be Zinc Coated by Hot-Dip (Fire) Method.** Wilhelm Püngel. *Stahl und Eisen,* v. 64, no. 7, Feb. 17, '44, pp. 101-105.

Studies of the structure, formation, regularity of thickness, and adhesiveness of the zinc layer. Behavior of the zinc-coated steel sheets when prepared by the dry and wet ($ZnCl_2$ flux) methods, (a) sand blasted, (b) sand blasted and further heat treated 1 hr. at 750° C, and (c) sand blasted and then normalized, in bend, deep drawing, and alternating bend tests. Steels ranging from 0.06 to 0.74% C were used.

7-80. **Metal Coating Facilitated by Ultrasound.** *Iron Age,* v. 154, August 24, '44, pp. 59, 104.

German experiments whereby ultrasound is used to lay a coating of tin onto aluminum sheet. The same technique could, perhaps, be employed for the hot dipping of aluminum onto steel.

7-81. **Supplemental Protection for Black-Oxide Finishes.** Mark Weisberg and Edward A. Parker. *Industrial Heating,* v. 11, August '44, p. 1304.

Comparison of types of oils and waxes used.

7-82. **Metallizing Non-Conductors.** I. Samuel Wein. *Metal Finishing,* v. 42, Sept. '44, pp. 534-538.

Historical survey; division of subject matter; basic steps necessary; advantages of metallizing; applications; mechanical films roughening the surface; conducting materials. 16 ref.

7-83. **Rust Resistant Coatings for Steel Products.** Jerome M. Bialosky. *Industrial Finishing,* v. 20, Sept. '44, pp. 22-23, 26-27.

Lacquer, paint, enamel coatings used on steel surfaces; paint coatings let in some moisture; surface treatment to prevent rusting; what phosphate coating does; methods of application; metal must be cleaned before being coated.

7-84. **Chemically Treated Steels for Food Cans.** C. M. Cosman. *Iron Age,* v. 154, Sept. 28, '44, pp. 54-58.

German experience with phosphatized and lacquered steel sheets in can making gives interesting data on the effects of primary treatments, the influence of the bond layer and the choice of suitable lacquers. Particularly unique is the widespread use of welded cans in Germany; and additionally interesting is the longer life obtained with certain foods with phosphatized cans than with tin cans.

7-85. **Tinning Cast Iron for Babbitted Bearings.** T. E. Eagan. *Metals & Alloys,* v. 20, Sept. '44, pp. 625-628.

"Kolene" process. Application to the cleaning of cast iron bearing shells prior to tinning and babbitting, and a supplementary editorial comment discusses variations of the method and other uses.

7-86. **Chemical Protection of Magnesium Alloys.** *Light Metals,* v. 7, Sept. '44, pp. 413-422.

Recent patents embodying comprehensive detail regarding fundamental theory of chromate processes and their commercial application.

7-87. **A Reappraisal of Electrogalvanizing.** Ernest H. Lyons. *Wire & Wire Products,* v. 19, Oct. '44, pp. 646-648, 732-733.

The shortcomings and the advantages of electrogalvanizing. The uniformity of the coatings, utilization of the zinc, and operating problems encountered are described. The superiority of electrogalvanizing destines it to much wider application in the future.

7-88. **Electro-Static Spraying and Detearing.** Harry Forsberg. *Die Casting,* v. 2, Oct. '44, pp. 71-72, 74-75.

Electrostatic detearing; electrostatic spraying. Used in spray and dip painting of die castings.

7-89. **Recent Improvements in Lead Alloy Coatings for Steel.** C. H. Hack, D. S. Kondrat and H. E. Zahn. *Metal Progress,* v. 46, Oct. '44, pp. 718-722.

War-time shortages in tin and zinc and a relative abundance of lead caused a quick conversion of many hot dip operations to the use of a lead alloy much lower in tin than the conventional terneplate coating. Formulation of a suitable flux, and a corrosion resistant lead containing the minimum of alloying constituents for successful bonding to the steel. Wide post-war use may be predicted.

7-90. **Protection of Steel Parts for Overseas Shipment.** Harold A. Knight. *Metals and Alloys,* v. 20, Oct. '44, pp. 934-940.

Modern and spectacular methods; three types of packaging; details of the methods; some newer techniques; protection against shock.

7-91. **Metallizing Non-Conductors.** Samuel Wein. *Metal Finishing,* v. 42, Oct. '44, pp. 610-613.

Bonding medium is considered to be any medium which can be applied to the given surface and the conducting medium subsequently applied to it, or may be mixed with the conducting medium and this in turn applied to the given surface. Different types of bonding mediums permit different types of processing.

7-92. **Conservation of Materials by Rust Prevention.** M. S. Clark, R. B. Thurston and Allen F. Brewer. *Machinery,* v. 51, Oct. '44, pp. 182-184.

Different methods of rust prevention; types of oils and compounds used for rust prevention; special rust-proofing oils; heavy non-drying rustproof compounds; hard-drying coatings.

7-93. **Anodic Treatment of the Aluminum Light Base Alloys.** E. E. Halls. *Metallurgia,* v. 30, Sept. '44, pp. 271-273.

Recent studies in the U. S. S. R. towards more rapid processes.

7-94. **An Investigation in the Surface Treating of Zinc Parts.** J. E. Stareck. *Die Casting,* v. 2, Nov. '44, pp. 70-71.

Developments and investigations in the problem of treating zinc surfaces.

7-95. **Metallizing in Aircraft Production.** G. C. Close. *Modern Machine Shop,* v. 17, Nov. '44, pp. 194, 196, 198, 200, 205-206, 208, 210, 212, 214.

The metallizing process has provided an efficient and economical means of protection against corrosion and salt water spray on aircraft parts.

7-96. **Metallizing Non-Conductors, III.** Samuel Wein. *Metal Finishing,* v. 42, Nov. '44, pp. 669-672.

Silvering glass.

7-97. **Electrolytic Finishes on Metal Improve Corrosion Resistance.** E. L. Cableck. *Product Engineering,* v. 15, Nov. '44, pp. 754-755.

Advantages and limitations in production and service of anodic and plated finishes on fittings. Methods for production testing of anodized coatings.

7-98. **Aluminum-Coated Sheet Steel Rates High in Corrosion Resistance.** *Product Engineering,* v. 15, Nov. '44, pp. 762-765.

New coating process permits quantity production. Physical properties of the material, applications, and spot welding characteristics.

7-99. **Aluminized Steel.** *Aircraft Production,* v. 6, Oct., '44, pp. 505-506.

Properties and method of welding.

7-100. **Galvanizing Fluxes.** A. T. Baldwin. *Iron & Steel,* v. 17, Oct. '44, pp. 645-646.

The effects and properties of the various fluxes.

7-101. **Electrotinning of Strip in the Alkaline Bath.** T. G. Timby. *Steel,* v. 115, Nov. 6, '44, pp. 124, 127-128, 176.

Dull surface of electrotinned strip is changed to conventional bright finish by eddy currents induced in the base metal as it passes through heating coils carrying high-frequency current. High efficiency is obtained by operating plating bath at a temperature ranging from 190 to 200° F.

7-102. **Lead Coatings on Steel.** Harold A. Knight. *Metals and Alloys,* v. 20, Nov. '44, pp. 1296-1301.

Lead coatings (especially certain specially formulated

lead alloy coatings) have often proved superior in their own right and lead coated steel has become of outstanding interest to designers seeking economical, easily workable and corrosion resistant materials for many types of post-war products; describes the coatings (both hot-dipped and electrolytic) and discusses their engineering properties and applications.

7-103. **Decorative Anodizing.** G. O. Taylor. *Canadian Metals and Metallurgical Industries,* v. 7, Nov. '44, pp. 41-42.

Processes developed to apply decorative patterns to anodized aluminum.

7-104. **Clad Steels Provide New Fields for Carbon Steels.** William G. Theisinger. *Canadian Metals and Metallurgical Industries,* v. 7, Nov. '44, p. 49.

Resistance to chemical attack is added when a corrosion resistant metal, such as nickel, is bonded to carbon steels to make clad steels.

7-105. **Protective Resin Films on Cartridge Brass.** H. Gisser. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking, Preprint no. 12, Nov. '44, 9 pp.

Films of phenol formaldehyde, vinylite, cyclid diolefine polymer and nitrocellulose were tested to determine their protective action on cartridge brass against attack by ammonia. Film-continuity studies demonstrated that the phenol formaldehyde films yielded continuous films on cartridge brass at lower film weights than the other materials tested. 10 ref.

7-106. **One-Coat Enameling Steel Is Developed With Exceptional Cold-Drawing Qualities.** *Steel,* v. 115, Dec. 18, '44, pp. 100, 151.

White and other colors of vitreous enamel applied directly to new steel—known as Inland Ti-Namel steel —without the prior application of a base or ground coat enamel; thinner covering of enamel produces a better surface, is less liable to chipping and has longer service life than multi-coat finishes. New alloy and process may result in more extensive use of vitreous enameled steel.

7-107. **Hot Dip Lead Coatings for Steel.** J. L. Bray. *Steel,* v. 115, Dec. 18, '44, pp. 110-112.

Procedure for applying pure lead and the composite coating method used by Continental Steel Corp.

7-108. **Metallizing Non-Conductors.** Samuel Wein. *Metal Finishing,* v. 42, Dec. '44, pp. 736-738.

Rochelle salt process; other silvering processes. 47 ref.

7-109. **Some New Techniques in Protective Coatings.** Carl Bauer. *Industrial Finishing,* v. 21, Dec. '44, pp. 36, 40, 42.

New one-coat finishing; plastic coatings; solventless finishes; hot-application techniques, including hot spraying, hot-melt dipping, flame-spraying; special high temperature curing.

7-110. **Synchronized High-Speed Lines for Steel Strip Provide Continuous Electrotinning.** Wesley F. Hall. *Steel*, v. 115, Dec. 25, '44, pp. 99-100, 121.

Systems handle strip from 14 to 38 in. wide, from 36 to 22 gage, at average speed of 500 ft. per min. Units are designed for automatic control, uninterrupted operation and uniformity of finish.

SECTION VIII

ELECTROPLATING

8-1. **Chromium Plating.** Wm. Whalen. *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 103, 120-121.

Use of hard chromium for prolonging tool life.

8-2. **Republic's Electrolytic Tin Plate Line Starts Production.** George R. Reiss. *Steel,* v. 114, no. 2, Jan. 10, '44, pp. 92-96.

In these plating cells the strip runs between contact rolls with vertical bus bar, connecting anodes; chemical treatment tank beneath rolls removes oxide film from brightened tin surface and applies thin adherent film which improves enamel adhesion and retards discoloration during baking operation; induction melting unit melts tin deposit and fuses it to steel base of strip; on top deck of plating section strip passes through a spray rinse. Recovery operation minimizes loss of plating solution containing valuable dissolved tin.

8-3. **Fundamentals of Chemistry for Electroplaters. III. Atomic Structure of Matter.** Samuel Glasstone. American Electroplaters Society *Monthly Review,* Jan. '44, pp. 17-20.

Combination of atoms by whole numbers, atomic weights, constant composition of compounds.

8-4. **An Electroplating Library—Revised and Amplified.** George B. Hogaboom, Sr. *Metal Finishing,* v. 34, no. 1, Jan. '44, pp. 14-15.

Supplement to list which was published in *Metal Finishing,* July, 1943.

8-5. **New Plating Process for Aircraft Instruments.** *Products Finishing,* v. 8, no. 4, Jan. '44, p. 50.

Alloy of Cu, Sn and Zn developed for plating Cu or brass parts of aircraft instruments.

8-6. **Feathering the War Birds.** Jeffrey R. Stewart. *Products Finishing,* v. 8, no. 4, Jan. '44, pp. 40-48.

Questions and answers on problems encountered in the finishing of military aircraft.

8-7. **Cadmium Plating Aircraft Parts.** Fred M. Burt and C. L. Savage. *Products Finishing,* v. 8, no. 4, Jan. '44, pp. 18-26.

Method of plating aircraft parts with cadmium used in one of the Douglas Aircraft Co. plants.

8-8. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, no. 4, Jan. '44, pp. 28-38.

Chemical equations and calculations for use in electroplating.

8-9. **Electrolytic Tin Plate.** K. W. Brighton. *Canadian Metals & Metallurgical Industries,* v. 7, no. 1, Jan. '44, pp. 21-24.

Its use in can manufacture. History, Sn conservation program, enamel adhesion and testing, chemical treatment, lubrication of electrolytic plate, soldering. 4 ref.

8-10. **The Salt Spray Test for Electrodeposited Metallic Finishes.** C. H. Sample. *Metal Industry,* v. 63, no. 26, Dec. 24, '43, pp. 410-412.

The salt spray test cannot be recommended as a quality test for electronegative type coatings. When thoroughly standardized and properly conducted the salt spray test is frequently useful in evaluating the degree of porosity of electrodeposited metallic coatings of the electropositive type. The time of exposure to the salt spray required to reveal a certain degree of porosity varies with the coating-basis metal combination being tested and should be correlated with actual exposure tests. The time required for "first rust" to appear is not as important as the appearance of the coating after a given length of time in the salt spray. The lack of experimental data correlating salt spray and service behavior of the wide variety of coating-basis metal combinations would indicate that except for revealing particularly inferior coatings the test does not merit its current extensive use in specifications.

8-11. **The Repair of Worn or Over-Machined Parts by Electrodeposition.** *Machinery* (London), v. 63, no. 1628, Dec. 23, '43, p. 715.

Hardness and thickness of deposits.

8-12. **New Electroplating Lines Apply Tin or Zinc,** *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 154-156.

The zinc plating process is essentially the same as the electrotinning process, eliminating only one operation, the reflow treatment which produces the shiny, mirror-like surface seen on tin containers. Although tin plate is produced at Weirton at a speed exceeding 1000 ft. per min., the zinc coating process is slower because heavier coatings are required on zinc-coated products.

8-13. **Zinc for Tin.** *Business Week,* no. 754, Feb. 12, '44, p. 50.

Coated sheets produced successfully on an electrolytic line designed for tin. Range of postwar uses explored.

8-14. **Corrosion and Its Prevention in the Plating Room.** Alfred Baechlin, Jr. *Metal Finishing,* v. 42, Feb. '44, pp. 74-76.

Discussion and full details of the three general types of floor drainage systems in use today in plating rooms, namely: individual drains or sumps, trench drains, and pitched floor.

8-15. **A New Electrolyte for Use in Electrotinning Lines.** *Blast Furnace and Steel Plant,* v. 32, Feb. '44, pp. 232-234.

Ribbon of steel swirls through a maze of machinery

and chemical baths at 1000 ft. a minute, emerging with a shining coat of bright tin in a new, continuous electroplating process that is aiding the tin plate industry by producing material for cans many times faster than older methods permitted. It is estimated that the yearly savings of tin resulting from the use of the electrolytic processes would total 1,200,000 lb. Known as the Halogen Tin Process and developed by the Electroplating Division of E. I. du Pont de Nemours & Co.

8-16. **The Fundamentals of Chemistry for Electroplaters.** Samuel Glasstone. American Electroplaters' Society *Monthly Review,* v. 31, no. 2, Feb. '44, pp. 121-124.

Definition of molecule, molecules of elements, molecular weights, Avogadro's law, molecular weights and densities of gases.

8-17. **Electrotinning Steel Strip at Weirton Steel.** *Metal Finishing,* v. 42, Feb. '44, pp. 77-79.

At normal operating speed, it takes the electrotinning installation at Weirton Steel Co. only 8 sec. to plate both sides of a specific section of steel strip. The process of electrotinning at this plant is explained, giving full details and technical data.

8-18. **The Chemistry of Electroplating—Part 5.** C. B. F. Young. *Products Finishing,* v. 8, Feb. '44, pp. 36-42.

Acids, bases, and salts are discussed, and under this heading are the important normal and molar solutions. Calculations involving inverse proportions are illustrated, and molecular weights and their uses; subject matter on sulphur and some sulphur compounds, and methods for making sulphuric acid are treated.

8-19. **Ventilation of Electroplating Departments.** Carlyle Artran. American Electroplaters' Society *Monthly Review,* v. 31, no. 2, Feb. '44, pp. 143-147.

Discussion of hoods, fume and dust ventilating systems, and centrifugal fans.

8-20. **Porous Chromium for Engine Cylinders.** H. Van der Horst. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 7 pp. (mimeo).

Summary of porous chromium plating cylinders to reduce cylinder piston ring, and piston ring groove wear. Porous chromium on aluminum, surface finish and wettability; inspection; sulphide printing porous chromium surfaces.

8-21. **Some Physical and Wear Characteristics of Porous Chromium Plated Rings.** Tracy C. Jarrett. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 5 pp. (mimeo).

Cylinder wear is greatly reduced by use of porous chromium plated ring in top groove. The chromium plated ring shows little wear under abnormal dust conditions; in fact, the apparent life of these rings is unusually good.

8-22. **Summary of Technique of Chrome Plating of Cylinder Barrels.** B. A. Yates. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 5 pp. (mimeo).

Various methods discussed. Preparation of the barrel, bond adherence, bath conditions.

8-23. **Electroplating Steel for Protection and Appearance.** M. B. Diggin. *Iron & Steel Engineer,* v. 21, Feb. '44, pp. 43-46.

By the use of proper "overcoats," steel may be protected and decorated so as to render it applicable to many uses thus far held by other materials. . . Postwar competition may put the steel plants into the electroplating business.

8-24. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, March '44, pp. 46-48, 50, 52, 54, 56, 58, 60.

True solutions and their properties discussed. Suspensions, emulsions, colloidal solutions, and the determination of atomic weights also discussed.

8-25. **Corrosion and Its Prevention in the Plating Room.** Alfred Baechlin. *Metal Finishing,* v. 42, March '44, pp. 136-138, 155.

Flooring materials, tile floor construction, paint for protection, protecting exhaust ducts, protecting the accessories.

8-26. **Republic Uses Two Electrotinning Lines at Its Niles Plant.** *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 343-345.

Continuous tinning process described.

8-27. **How to Chromium Plate for Greater Tool Life.** R. W. Bennet. *Machinery,* v. 50, no. 7, March '44, pp. 190-194.

Procedure followed at the Springfield, Mass., plant of the Westinghouse Electric & Mfg. Co. to increase tool life with consistent and successful results.

8-28. **Alkaline Zinc Plating Sodium Zincate Solutions.** N. A. Tope. American Electroplaters' Society *Monthly Review,* March '44, pp. 229-246.

Change from cadmium to zinc plating. Equipment, solutions and technique used.

8-29. **The Fundamentals of Chemistry for Electroplaters.** Samuel Glasstone. American Electroplaters' Society *Monthly Review,* March '44, pp. 254-257.

Importance of atomic weights, determination of equivalent weights, equivalent weight and atomic weight and approximate atomic weight methods.

8-30. **Novelties in Electroplating.** *Steel,* v. 114, March 20, '44, pp. 94, 128-129.

Some studies in plating colors, depositing alloys and the like.

8-31. **Iron Plating.** William B. Stoddard. *Iron & Steel,* v. 17, March '44 pp. 292-294.

An improved solution for depositing ductile metal.

8-32. **Electrotinning Operations.** H. P. Munger. *Iron & Steel Engineer,* v. 21, March '44, pp. 53-64.

Built for DPC by Republic, each of these two electrotinning lines is designed toward the production of high quality plate under carefully controlled conditions.

8-33. **Pre-Plated Metals in Wartime.** *Steel,* v. 114, April 3, '44, pp. 120, 162, 164.

Lower cost electrocoating to displace piece plating.

8-34. **Porous Chromium Plating Diesel Cylinder Liners.** *Iron Age,* v. 153, April 6, '44, pp. 50-53.

Plating cylinder walls with a thick layer of hard chromium, applied by a process that leaves the plated surface in a porous condition, has increased cylinder life as much as 2000%.

8-35. **Nickel Plating.** Thomas McFarlane. American Electroplaters' Society *Monthly Review,* v. 31, April '44, pp. 341-349.

New developments in this field.

8-36. **The Fundamentals of Chemistry for Electroplaters.** Samuel Glasstone. American Electroplaters' Society *Monthly Review,* v. 31, April '44, pp. 351-354.

Chemical formulas; their determination and use.

8-37. **Porous Chromium in Engine Cylinders.** Russell Pyles. American Society of Mechanical Engineers *Transactions,* v. 66, April '44, pp. 205-214.

Properties inherent in porous chromium which contribute to its low wear rate in engine cylinders, i.e., hardness, exceeding that of any other cylinder-lining material; high thermal conductivity; low friction coefficient, and low affinity for other metals; corrosion resistance, preventing surface deterioration. 12 ref.

8-38. **Further Experiments in Rainbow Plating.** Oliver P. Watts. Electrochemical Society Preprint No. 85-13, 2 pp.

Electrodeposition of brilliantly colored plates on metallic cathodes from a hot solution of ammonium molybdate. The results of further experiments with this solution are presented and also an account of the production of similar colors on anodes in a solution of sodium plumbate.

8-39. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, April '44, pp. 54-56, 58, 60, 62.

Compounds of nitrogen and their properties.

8-40. **Salvage by Electrodeposition.** Harold Narcus. *Metal Finishing,* v. 42, May '44, pp. 267-269.

Heavy nickel plating offers the following principal advantages: Ease of machining of nickel after heavy plating as compared to chromium; higher current efficiency, faster rate of deposition and better throwing power of the nickel plating bath; cheaper installation resulting from cheaper rack and plating tank construction; less power consumption for plating.

8-41. **The Chemistry of Electroplating. Part 8.** C. B. F. Young. *Products Finishing,* v. 8, May '44, pp. 58-60, 62, 64, 66.

Properties of free element Na; properties of combined element dissolved Na; Cl; combined Cl.

8-42. **The Fundamentals of Chemistry for Electroplaters. VII.** Samuel Glasstone. American Electroplaters' Society. *Monthly Review,* v. 31, May '44, pp. 443-446.

Chemical reactions, chemical equations, weights in chemical reaction, other chemical reactions.

8-43. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, June '44, pp. 82-84, 86, 88, 90, 92, 94, 96.

Ionic reactions are illustrated in detail and compounds studied.

8-44. **The Use of Insulation and Fixtures in Precision Selective Plating.** C. T. Wells. *Metal Finishing,* v. 42, June '44, pp. 338-341.

Production selective plating is highly dependent on choosing the proper insulation and is oftentimes aided by proper design and use of a blocking fixture. Outlined in detail are plastic solutions, lacquers, wax, and molded plastic masks.

8-45. **The Use of Zinc Dust in the Purification of Zinc Plating Solutions.** Myron Diggin. *Metal Finishing,* v. 42, June '44, p. 344.

To produce acceptable zinc deposits, alkaline zinc plating solutions must be free from heavy metal impurities. Inspection of the parts plated with zinc is made difficult by the presence of impurities which cause dark, smutty or streaked deposits. Deposits containing heavy metal impurities do not have as high a protective value as pure electrolytic zinc. Subsequent finishes such as Cronak, Bonderizing, etc., are difficult to apply to deposits produced in a solution containing metallic impurities.

8-46. **Tinning Cast Iron.** R. A. Cresswell. *Tin & Its Uses,* No. 15, March '44, pp. 3-4.

A wide range of cast irons can be very successfully hot-tinned if they are suitably prepared, and the procedure now devised is less complicated than some of the processes hitherto in use.

8-47. **Modern Electro-Tinning.** *Tin & Its Uses,* No. 15, March '44, pp. 15-16.

Electro-tinned coatings are widely applied to fabricated articles and components to provide corrosion resistance and improved solderability.

8-48. **New Nickel-Iron Alloy for Electroplating.** A. H. Du Rose and P. R. Pine. *Steel,* v. 114, June 12, '44, p. 124.

Extensive research develops "bright" deposit of fine crystal structure, high in tensile strength yet ductile, with good corrosion resistance and simplicity in application. Labeled "new composition of matter" due to many unusual properties.

8-49. **Zinc Plating of Large Aircraft Structures.** Manuel Sanz. *Iron Age,* v. 153, June 15, '44, pp. 64-70.

The equipment and technique employed in zinc plating of large and complex aircraft structures. Also mentioned are the cleaning and passivating practices, as well as data on changing the tanks from cadmium to zinc plating.

8-50. **Engineered "Erosion."** G. W. Birdsall. *Steel,* v. 114, June 19, '44, pp. 82-83, 156, 158-160.

Gives to chromium-plated surfaces the porosity needed to lubricate them properly, thus greatly reducing wear and thereby extending life of engine cylinders and piston rings. Important war uses forecast greatly expanded postwar application of the process.

8-51. **The Halogen Tin Process.** *Western Metals,* v. 2, June '44, pp. 25-26, 29.

New Du Pont electrotinning method offers advantages.

8-52. **Metallic Substitutes for Hot-Dipped Tin Plate.** Roger H. Lueck and Kenneth W. Brighton. *Industrial & Engineering Chemistry (Ind. Ed.),* v. 35, June '44, pp. 532-540.

Since about half of the tin imported is used for tin plate, most of which is fabricated into cans, the tin conservation program of the canning industry is of major importance. This program hinges on the utilization of bonderized black plate and 0.5 lb. electrolytic tin plate as substitutes for hot-dipped tin plate. The performance of these conservation plates in food cans is briefly described. 11 ref.

8-53. **The Fundamentals of Chemistry for Electroplaters.** Samuel Glasstone. American Electroplaters' Society *Monthly Review,* v. 31, July '44, pp. 635-638.

Oxidation and reduction.

8-54. **Inspection Tests for the Adhesion of Electroplated Coatings with Particular Reference to the B.N.F. Adhesion Test.** A. W. Hothersall and C. J. Leadbeater. Electrodepositor's Technical Society Reprint, '44, 13 pp.

B.N.F. adhesion test developed for use in the inspection of electroplated coatings. The test was designed to enable non-adherent or, at the best, very slightly adherent coatings of ordinary commercial thickness (up to 0.002 in.) to be detected. It appears to have possible applications to coatings, both metallic and non-metallic, formed by other methods.

8-55. **Studies on Brass Plating.** S. G. Clarke, W. N. Bradshaw and E. E. Longhurst. Electrodepositors' Technical Society Reprint, '44, 26 pp.

Tests on brass plating baths, carried out with special reference to the effects of the various factors on the composition of the deposit and its efficiency of deposition. 26 ref.

8-56. **Zinc Plating of Large Aircraft Structures.** Manuel Sanz. *Modern Industrial Press,* v. 6, June '44, pp. 52, 54, 56, 58.

A three-in-one operation which makes possible the cleaning, zinc plating and demagnetizing of a metal surface in a single tank. The technique not only has proved itself more economical but has been found more effective than the former painting method.

8-57. **Further Experiments in Rainbow Plating.** Oliver P. Watts. *Products Finishing,* v. 8, July '44, pp. 36-38.

Formula for molybdate rainbow-plating. Addition of ammonium carbonate as a conducting salt widens the bands of color. For variety in colors, it is necessary that the deposit vary in thickness.

8-58. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, July '44, pp. 42-44, 46, 50, 52, 54, 56.

Halide family is treated, and in the latter part the periodic law of the elements is developed and illustrated.

8-59. **Operates Three Continuous Tin Plate Lines.** *Steel,* v. 115, July 17, '44, pp. 126-128.

Sparrows Point plant has a daily output of 4000 base boxes of half-pound plate. Alkaline plating bath is employed and six lines for brightening or reflowing operation. Sequential steps in process presented.

8-60. **Watch Plated Plastics, They're on the Move.** *Modern Industry,* v. 8, July 15, '44, pp. 38-40.

Advantages and disadvantages of plastics.

8-61. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, August '44, pp. 44-46, 50, 52, 54, 56.

Phosphorus and alkaline earth families, and aluminum and silicon families studied.

8-62. **Plastics in the Plating Industry.** Harold Narcus. *Metal Finishing,* v. 42, August '44, pp. 470-474.

Synthetic rubber, when properly compounded, is suitable for practically all types of electroplating with the exception of chromium plating and can be used with almost every type of inorganic acid.

8-63. **High-Frequency Generators for Fusion of Tin Plate.** H. G. Frostick. *Steel,* v. 115, July 31, '44, pp. 90-92, 94.

Erection, adjustment and maintenance of high-frequency heating generators serving electro-tinning lines differ from the usual industrial electrical equipment. Stability of generator operation is a vital factor. Maintenance department considers vacuum tube generators and associated apparatus a part of their watch-care.

8-64. **Plastic Material for Electroplating Shields.** Harry W. Tompkins. *Aero Digest,* v. 46, July 15, '44, pp. 109-110, 112, 130.

Shields incorporate metal parts; shields for multiple plating; electrodes cast in shields.

8-65. **Plating Practices of the Aircraft Industry.** *Iron Age,* v. 154, August 10, '44, pp. 56-57.

The use of zinc plating has increased under the stress of cadmium shortages. Procedures for both operations are described including the plating sequences from precleaning and pickling through the actual plating operations and passivation.

8-66. **The Formation of a Hard-Zinc During Zinc Coating by the Lead-Zinc Bath.** Keinz Bablik. *Stahl und Eisen,* v. 64, no. 8, Feb. 24, '44 pp. 120-122.

The lead-zinc bath. Comparison of the pure-zinc bath method in relation to formation of hard-zinc. Relative activities of pure Zn and Zn-Pb alloys in forming Fe-Zn compounds.

8-67. **The Fundamentals of Chemistry for Electroplaters.** Samuel Glasstone. American Electroplaters Society *Monthly Review,* v. 31, August '44, pp. 699-702.

Metals and non-metals.

8-68. **Apparatus for Automatic Control of Electrodeposition with Graded Cathode Potential.** C. W. Caldwell and Robert C. Parker, and Harvey Diehl. *Industrial & Engineering Chemistry, Analytical Ed.,* v. 16, August '44 pp. 532-535.

Metal may be separated by cathodic deposition from a metal lying closely above it in the electro-motive series. Device consists of a vacuum tube amplifier which magnifies the cathode-calomel voltage sufficiently to actuate a relay and motor which drives a Variac; the Variac governs the size of an alternating current. 4 ref.

8-69. **Continuous Electroplating of Steel Strip.** D. A. Swalheim. *Iron & Steel Engineer,* v. 21, August '44, pp. 55-62, 82.

Since electro-coatings may be deposited to the thicknesses demanded by specific uses, electroplating will undoubtedly be applied even more extensively in the future. The deposits are more uniform in thickness and relatively pore-free in comparison to hot dip coatings. Electro-galvanizing of strip steel has been carried out successfully for some time. Lead, lead-tin alloys, copper, brass, nickel and different dual coatings may find extensive applications to strip steel.

8-70. **Rubber Marking for Selective Plating.** H. N. Nilson. *Tool Engineer,* v. 14, Sept. '44, pp. 88-90.

Search for a low-cost method of "stopping off" copper plating for selective carburization was intensified by need for partly plating tooth involutes. Foote Brothers Gear and Machine Corp.'s simple rubber masks improved over wax, tapes, and stop-off lacquers.

8-71. **Electro-Deposition for Engineering Purposes.** A. W. Wallbank. *Metal Treatment,* v. 11, Summer '44, pp. 131-134, 136.

Control, adhesion, sequence, time, selection; properties, thickness, reclamation, production, tools of chromium, nickel, copper, and other metals treated briefly.

8-72. **The Properties of Acids.** Samuel Glasstone. American Electroplaters Society *Monthly Review,* v. 31, Sept. '44, pp. 787-790.

Properties of acids, bases, and salts.

8-73. **Passenger Car Equipment and Locomotives.** T. R. Boggess, American Electroplaters Society *Monthly Review,* v. 31, Sept. '44, pp. 801-804.

Brass plating; copper plating; chromium plate over nickel plate; silver plated; zinc plating; hard chromium plating; passenger equipment cars; locomotives.

8-74. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 8, Sept. '44, pp. 30-32, 34, 36, 38, 40, 42, 44, 46, 50, 52.

Transition group composed of Fe and Co and Ni treated. Zn, Cd and Hg, and Sn and Pb studied.

8-75. **Determination of Zinc in Cyanide Brass-Plating Baths.** A. S. Miceli and I. O. Larson. *Metal Finishing,* v. 42, Sept. '44, pp. 547-548.

Procedure; limitations and errors. 5 ref.

8-76. **A New Development in Electrodeposition of Brass.** John Kronsbein and Alan Smart. Electrodepositors Technical Society *Journal,* v. 19, '44, pp. 107-122.

General mechanical and electrical design; description of the brass plating plant; development of the brass plating process employed; large-scale production. 9 ref.

8-77. **Chromium Plating for Longer Tool Life.** R. W. Bennet and C. Hastie. *Machinery* (London), v. 65, August 31, '44, pp. 236-238.

To obtain the desired results with chromium plated tools, it is necessary to establish a common ground of understanding between tool engineers and platers so that their combined knowledge can be applied in making experiments and the reasons for success and failure fully understood.

8-78. **The Chemistry of Electroplating.** C. B. F. Young. *Products Finishing,* v. 9, Oct. '44, pp. 62-64, 66, 68, 70, 72, 74.

Copper, silver, gold, platinum, rhodium and tungsten are all below hydrogen in the electromotive series, therefore, do not displace this material from the acids, but can be dissolved only by oxidizing acids. In the case of gold, it is attacked only by a mixture of hydrochloric and nitric acids.

8-79. **Lead Plating.** J. L. Bray. *Steel,* v. 115, Oct. 9, '44, pp. 128-129, 288, 290, 292.

May find increasing applications after the war in protecting steel against corrosion, since many earlier shortcomings of the process have been overcome. Smooth, uniform and dense deposits within close tolerances now being obtained.

8-80. **The Fundamentals of Chemistry for Electroplaters, XII.** Samuel Glasstone. *Monthly Review,* v. 31, Oct. '44, pp. 909-912.

The chemistry of some common acids.

8-81. **Notes on Industrial Health Hazards Connected with Cadmium Plating.** Paul A. Neal, Lawrence T. Fairhall, and K. Gustaf Soderberg. *Monthly Review,* v. 31, Oct. '44, pp. 919-920.

Inhalation of cadmium containing dusts and fumes.

8-82. **Estimation of Ammonia in Electrolysed Cyanide Plating Solutions.** C. M. Blow, N. G. Hiscox, and M. W. Smith. Electrodepositors' Technical Society Preprint, v. 19, '44, pp. 147-156.

Investigation carried out in connection with the control of a conventional brass plating vat to produce 70/30 brass of a quality suitable for rubber bonding. 4 ref.

8-83. **Thickness Measurements of Electrodeposited Metals.** Richard B. Saltonstall. *Metal Finishing,* v. 42, Oct. '44, pp. 606-609, 638-639.

Quality plating specifications should call for certain minimum thicknesses on significant surfaces for various types of exposure. However, practical limitations of electroplating processes should be considered when writing such specifications.

8-84. **A Sulfate-Chloride Solution for Iron Electroplating and Electroforming.** R. M. Schaffert and Bruce W. Gonser. *Metal Finishing,* v. 42, Oct. '44, pp. 614-616.

Investigations on iron electrodeposition were prompted by restrictions on the uses of copper and nickel in the electrotyping and stereotyping industry. 20 ref.

8-85. **Cathode Potential, Efficiency and Throwing Power of Nickel Plating Solutions.** W. A. Wesley and E. J.

Roehl. Electrochemical Society Preprint 86-6, Oct. 16, '44, 10 pp.

Characteristics of nickel chloride, hard nickel and Watts' plating solutions measured. Analysis of the data shows that nickel chloride and hard nickel baths should show higher throwing power than either the low pH or high pH Watts bath. Metal distribution data obtained in a Haring-Blum cell support this conclusion and tend to verify the Gardam equation for current distribution.

8-86. **Electrodeposition on the Inside of Eccentric Cylinders.** R. A. Schaefer and J. B. Mohler. Electrochemical Society Preprint 86-8, Oct. 16, '44, 9 pp.

Data presented on the variation of the deposit on the inside of eccentric cylinders with an internal anode. These data correlated with the theoretical current distribution between eccentric cylinders.

8-87. **A Rotating Cathode Cell for Strip Plating Evaluation.** D. A. Swalheim. Electrochemical Society, Preprint 86-12, Oct. 16, '44, 17 pp.

Strip plating with a rotating cathode.

8-88. **Flash Chrome Plating to Size.** C. L. Tanner. *Mechanical Engineering,* v. 66, Nov. '44, pp. 726, 728.

Hard chrome plating; flash plating process; applications to cutting tools; flash chrome effective as gage finish.

8-89. **A Sulfate-Chloride Solution for Iron Electroplating and Electroforming.** R. M. Schaffert and Bruce W. Gonser. *Metal Finishing,* v. 42, Nov. '44, pp. 666-668, 678.

Applications.

8-90. **Continuous Electro-Zinc Plating.** J. Raymond Erbe. *Iron Age,* v. 154, No. 16, '44, pp. 70-72.

A brief discussion of some of the problems encountered in adapting various electrotinning units for continuous steel strip to electrolytic zinc plating of the strip.

8-91. **Building Up Worn Parts by Electrodeposition.** A. W. Hothersall. *Iron Age,* v. 154, Nov. 23, '44, pp. 47-51, 114.

Reviews some of the technical factors relating to electrodeposition in general and contrasts the relative advantages of nickel and chromium plating.

8-92. **New Lead Plating Process. Allen G. Gray.** *Steel,* v. 115, Nov. 27, '44, pp. 78-80, 114, 116, 118, 120.

Based upon commercial production of sulfamic acid; is developed for application of low cost protective coating to steel. 13 ref.

8-93. **Practical Aspects of Hard Chrome Plating.** J. L. Vaughan and I. A. Usher. *Canadian Metals and Metallurgical Industries,* v. 7, Nov. '44, pp. 20-30, 53.

Data useful to the designer, plater and machinist; plating department; equipment and processes; handling and routine of work; racking; applications and results.

8-94. **Bright Alloy Plate.** *Products Finishing,* v. 9, Dec. 44, p. 34.

Coating consists of an alloy of copper, tin and zinc. Alloy anodes of the same composition as the deposit have been perfected. Metal concentration of the bath

maintained automatically. Parts emerge from the solution bright and are blue-white in color.

8-95. **Porous Chromium Plating Piston Rings.** Tracy C. Jarrett and Robert D. Guerke. *Products Finishing,* v. 9, Dec. '44, pp. 36-38, 40, 42.

Details and application of the van der Horst process of porous chromium plating to piston rings. Advantages are wear resisting qualities and longer service and reduction in the wear of the cylinder bores.

8-96. **Wetting Agents—Their Use in Electroplating and Allied Processes.** H. Silman. *Metallurgia,* v. 30, Oct. '44, pp. 321-326.

Use of wetting agents has increased in recent years and further advances are likely as the properties and limitations of these materials become more fully known.

8-97. **Evaluation of Strip Plating Solutions.** *Steel,* v. 115, Dec. 18, '44, pp. 102, 104.

Laboratory plating cell employing a rotating cathode determines the operating characteristics of plating solutions. Unit serves as a means for predicting the results to be expected in commercial strip plating installations. Its construction, operation and applications are presented in detail.

8-98. **Increased Piston Ring Life by Porous Chromium Plating.** Tracy C. Jarrett and Robert D. Guerke. *Metal Finishing,* v. 42, Dec. '44, pp. 732-735.

H. van der Horst porous chromium plating process produces porous chromium wearing surfaces which resist wear. The porous chromium plate applied to piston rings is different from the usual bright plate. It is applied to the cylinder contacting surface of the piston ring and permits the ring to seat itself quickly, without wearing out.

8-99. **The Chemistry of Some Common Bases.** Samuel Gladstone. *Monthly Review,* v. 31, Dec. '44, pp. 1133-1136.

Bases in electroplating; sodium and potassium hyroxides; manufacture; preparation and properties of lime; preparation and properties of ammonia.

SECTION IX

ELECTROMETALLURGY

9-1. **Electrolytic Production of Cobalt.** *Metallurgia*, v. 29, no. 169, Nov. '44, pp. 37-40.
Recent work on this subject is reviewed. 7 ref.

9-2. **How Electrolytic Antimony Is Made at Sunshine Plant.** W. Church Holmes. *Engineering & Mining Journal*, v. 145, March '44, pp. 54-58.
Flowsheet of plant.

9-3. **Pure Columbium.** Clarence W. Balke. *Electrochemical Society Preprint* No. 85-3, April '44, 6 pp.
Separation of columbium from tantalum and other constituents by fractional crystallization of complex salts and fractionation of metal chlorides at elevated temperature produces a very pure columbium oxide. A new process for reducing this oxide to pure Cb metal is described.

9-4. **The Reactivity of Aluminum, Zinc, and a Zinc Base Die Casting Alloy with Various Electrolytes.** Joseph V. Petrocelli and Arthur Phillips. *Electrochemical Society Preprint* No. 85-6, April '44, 20 pp.
Electrochemical behavior of Al, Zn, a Zn base die casting alloy and its constituents. Corrosion current on pure Al and Zn determined by a cathodic polarization method and checked by weight loss measurements. Explanation offered of the mechanism of the blistering phenomenon in electrodeposits on zinc base die castings. 15 ref.

9-5. **Correlation of Solution Potentials with Orientations of Single Crystals of High Purity Aluminum.** C. J. Walton. *Electrochemical Society Preprint* No. 85-7, April '44, 14 pp.
Large-grained specimens of high purity aluminum were prepared by the strain-anneal method. Differences in solution potential with marked changes in orientation were very small, and perhaps were not significant. However, there were differences in the rate of attack of the different crystal faces which are considered of significance. 8 ref.

9-6. **A Study of Impurities in Cobalt Electrowinning.** Ruth E. Churchward, F. K. Shelton and R. G. Knickerbocker. *Electrochemical Society Preprint* No. 85-10, April '44, 20 pp.
In electrolyzing a standard fluoborate electrolyte con-

taining 20 g. per l. cobalt as CoSO, 50 g. per l. boric acid, and 5 g. per l. NaF at 25 amp. per sq. ft. (2.7 amp. per sq. dm.) using lead anodes and stainless steel cathodes, the maximum tolerance for metallic impurities for the production of satisfactory 7-hour cobalt electrodeposits is in mg. per l.: Zinc 10; cadmium 1; arsenic (trivalent) 3; arsenic (pentavalent) 1; antimony (trivalent) 10; mercury (divalent) 1. Trivalent and hexavalent chromium in concentrations up to 100 mg. per l. were only slightly harmful, while nickel, copper, iron, and manganese were not found deleterious. 18 ref.

9-7. **Determination of Small Amounts of Chloride in Copper-Refining Electrolyte by Potentiometric Titration.** Yu-Lin Yao. Electrochemical Society Preprint No. 85-11, April '44, 6 pp.

Control method for the determination of small amounts of chloride in copper-refining electrolyte by potentiometric titration with silver nitrate solution. Silver-silver chloride electrode is used as the indicating electrode. A normal calomel electrode is used as the reference electrode. The equivalence point is estimated by finding the volume of titrant required to bring the cell to a definite potential.

9-8. **Electrolytic Hydrogen Cells of Trail Design.** B. P. Sutherland. Electrochemical Society Preprint No. 85-12, 7 pp.

Characteristic feature of the cell is the concrete top which supports the electrodes, the asbestos diaphragms, the asbestos collecting skirt, the feed water pipes, and the bus bar and gas main connections. The life of the new cells is better than six years. The cost of the new cells is a little over half that of older types.

9-9. **Electrochemistry in the Post-War World.** R. M. Burns. Electrochemical Society, Preprint 85-23, 6 pp.

In the post-war world electrochemistry should create new products and new industries, and by process improvement and increased efficiency should reduce the cost of existing products and insure their wider distribution. Electrochemical industry will require abundant and reasonably priced electric power to operate processes, research to develop new things, trained engineers to direct technology, and an intelligent and sympathetic governmental attitude toward private enterprise.

9-10. **Electrical Energy Consumption in Electrolytic Processes.** H. Walde. (*Die Chemische Technik*, v. 16, Aug. 14, '43, pp. 153-7.) *Engineers' Digest*, v. 1, May '44, pp. 331-333.

Improvements of the electrolytic process center around the problems of designing a plant of maximum efficiency, and of operating it in such a way as to maintain highest possible efficiency in continuous plant operation.

9-11. **The Extraction of Tin from Tin Cans by Means of Electrometallurgical Methods.** S. H. Cankut. Thesis for M.Sc. Degree, Massachusetts Institute of Technology, 1943.

9-12. **Electrometallurgical Treatment of Ores.** Charles Hart. *Blast Furnace & Steel Plant,* v. 32, June '44, pp. 673-674, 691-694.

Facts, figures and furnaces pertaining to manufacturing of steel, pig iron, and ferro-alloys.

9-13. **The Effect of Certain Variables on the Electrodeposition of Manganese.** J. H. Jacobs, R. E. Churchward and R. G. Knickerbocker. Electrochemical Society Preprint 86-10, Oct. 16, '44, 9 pp.

Results obtained upon the effect of certain variables on the electrodeposition of manganese, namely, time of deposition, cathode current density and cell temperature. 8 ref.

9-14. **Manganese.** D. D. Howat. *Mine and Quarry Engineering,* v. 9, August '44, pp. 187-193.

Electrolytic deposition of manganese by high acid process.

9-15. **A Study of the Possibility of Precipitation of Antimony as Oxychloride in Copper - Refining Electrolyte.** Yu-Lin Yao. Electrochemical Society Preprint No. 86-1, Oct. '44, 6 pp.

Chloride is an essential constitutent of copper-refining electrolyte. It is well known that chlorides minimize the tendency for codeposition of antimony with copper. For many years precipitation of antimony as oxychloride has been offered as an explanation of this effect. In this paper evidences are given to show that this explanation is incompatible with facts.

9-16. **Current Efficiency Studies of the Hooker Type S Chlorine Cell.** R. L. Murray and M. S. Kircher. Electrochemical Society Preprint No. 86-2, Oct. '44. 27 pp.

Study to determine the relative magnitude of the various processes causing loss of current efficiency in Hooker Type S chlorine cells. Calculation of current efficiency from the oxygen and carbon dioxide content of the cell gas; relationship between current efficiency loss and various reactions occurring in the cell investigated and quantitative relationships between ion concentrations and current efficiency loss developed.

9-17. **Historic Development of Caustic-Chlorine Cells in America.** Electrochemical Society Preprint No. 86-3, Oct. '44, 38 pp.

Development of the American electrolytic alkali-chlorine industry extends over 100 years. Chemical and commercial difficulties had to be overcome.

9-18. **Functions of Chloride in Copper-Refining Electrolyte.** Yu-Lin Yao. Electrochemical Society, Preprint 86-7, Oct. 16, '44, 10 pp.

Chloride concentration of copper-refining electrolyte is correlated with the cathode polarization and with the grain size and hardness of the copper deposit.

9-19. **Graphite Anodes in Brine Electrolysis.** Neal J. Johnson. Electrochemical Society Preprint 86-9, Oct. 16, '44, 10 pp.

A laboratory alkali-chlorine cell closely duplicating anodic conditions in commercial brine electrolysis permitted an investigation to determine the influence of

individual cell operating variables, including brine feed rate, brine concentration, anode current density, and cell temperature, on graphic anode corrosion rate.

9-20. **Ore Treatment.** Charles Hart. *Iron & Steel,* v. 17, Oct. '44, pp. 650-653.

Possibilities of electrometallurgical working in the U. S. A.

SECTION X

ANALYSIS

10-1. Spectrographic Flat Surface Sparking Technique of Steel Analysis. Charles L. Guettel. *Journal,* Optical Society of America, v. 34, no. 1, Jan. '44, pp. 41-46.

Spectrographic, routine testing laboratory method of steel analysis involving a flat surface sparking technique.

10-2. Use of Briquets Formed from Metal Grindings for the Spectrographic Analysis of Steel. R. E. Nusbaum and J. W. Hackett. *Journal,* Optical Society of America, v. 34, no. 1, Jan. '44, pp. 33-40.

¼" briquets are formed from particles smaller than 150 mesh, obtained by grinding. These particles are separated from the metal grindings by a magnetic or an electrostatic separator. 2% C is added, and the particles are then pressed into a briquet with a pressure of 163,000 psi. Spectrographic analysis of the briquet; comparison of briquets and rods; suppression of effects of segregation; preparation of a series of standards.

10-3. Hardness Measurement as a Rapid Means for Determining Carbon Content of Carbon and Low-Alloy Steels. K. L. Clark and Nicholas Kowall. *Metals Technology,* v. 11, no. 1, Jan. '44, 5 pages.

Method described is satisfactory for C control during melting of plain C and low-alloy steels as (1) results are reproducible and sufficiently accurate; (2) testing procedure is rapid; (3) method simple to use, and (4) calibration of hardness testing equipment can be checked easily and quickly. 9 ref.

10-4. Sulphur Extracted from Coke Oven Gas by the Ammonia Thylox Method. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 119-120.

Operation of apparatus for extracting sulphur from coke oven gas.

10-5. Gravimetric Determination of Tungsten. John H. Yoe and A. Letcher Jones. *Industrial & Engineering Chemistry,* v. 16, no. 1, Jan. '44, pp. 45-48.

A new organic compound has been developed as a reagent for the gravimetric determination of tungsten. Its physical and chemical properties have been investigated and procedures are given for its use in the determination of tungsten in ores and alloys. Determinations

of tungsten with the new reagent are equivalent in accuracy to the standard cinchonine method.

10-6. **Polarographic Determination of Copper, Lead and Cadmium in High-Purity Zinc Alloys.** R. C. Hawkings and H. G. Thode. *Industrial & Engineering Chemistry,* v. 16, no. 1, Jan. '44, pp. 71-74.

A study has been made on the application of the polarographic method of analysis in determining trace elements (down to 1 x 10^{-4}%) found in zinc-base die casting alloys. Trace amounts of lead, cadmium, and tin cause intergranular corrosion which results in a serious weakening of the alloy. A polarographic procedure has been developed for the direct determination of copper, cadmium and lead in these alloys. The samples are dissolved in hydrochloric and nitric acids, evaporated to near dryness, redissolved, treated with hydroxylamine hydrochloride, and finally diluted to volume. The solution is then electrolyzed cathodically over a range of approximately 0.8 volt to obtain waves for copper, lead and cadmium. Using an 8-gram sample in 50 ml. of solution, these elements can be determined with a precision of $\pm$ 1 x 10^{-4}% of the sample weight.

10-7. **Spot Test for Non-Ferrous Alloys.** *Metal Progress,* v. 45, no. 2, p. 296.

Method for identifying iron, lead and nickel in non-ferrous bearings and castings by macro-etching or printing.

10-8. **A Method for the Determination of Alumina in Anodic Baths and Other Solutions Containing Hexavalent Chromium.** Winslow H. Hartford. *Metal Finishing,* v. 42, Feb. '44, pp. 72-73.

A method has been developed for determination of alumina in the presence of chromic acid, and is suitable for the analysis of anodic baths. When substantial quantities of alumina are present, an accuracy of 1% may be expected, but with small quantities of alumina, the method is less accurate. Moderate quantities of copper and trivalent chromium do not interfere, but iron is harmful. 9 ref.

10-9. **Metallurgical Microchemistry.** E. C. Pigott. *Metal Treatment,* v. 10, Winter, '43-'44, pp. 239-248, 272.

Microchemical analyses of metals showing how, after an approved technique has been established, reliable and consistent results can be obtained for most elements at a fraction of the cost of conventional chemical analyses, on a minute portion of sample.

10-10. **The Determination of Sulphur and Phosphorus in Pig Iron.** Blast-Furnace Materials Analysis Sub-Committee. *Engineers' Digest,* v. 1, Feb. '44, pp. 187-188.

Sampling, and sulphur and phosphorus determinations.

10-11. **Identification of Non-Metallic Inclusions in Steel.** C. A. E. Wilkins. *Metal Treatment,* v. 10, Winter, '43-'44, pp. 211-224.

Identification of inclusions in steel and a simple and easily workable system for the rapid identification of the more common inclusions.

10-12. **Rapid Determination of Chromium, Nickel and Manganese.** R. H. Jacoby. *Foundry,* v. 72, March, '44, pp. 111-112, 178.

Method of analysis for determining residual alloy percentage in ordnance work.

10-13. **A Review of Analyses for Gases in Steel.** Clarence E. Sims and Geo. A. Moore. *American Foundryman,* v. 6, March, '44, pp. 15-17.

A review of the Fourth Report (paper No. 22, July 1943) of the Oxygen Subcommittee of the Committee on the Heterogeneity of Steel Ingots of the British Iron and Steel Institute. Determination of oxygen, hydrogen, nitrogen, vacuum heating methods.

10-14. **Polarographic Technique: A Survey.** J. T. Stock. *Metallurgia,* v. 29, Jan. '44, pp. 155-158.

The polarograph, and in particular the recording polarograph, offers a useful means of estimating traces and minor constituents. Many variations in technique may be employed to suit different requirements, and a number of these are described.

10-15. **Dithizone as a Microchemical Reagent.** F. T. Beaumont. *Metallurgia,* v. 29, Feb. '44, pp. 217-220.

Dithizone has now become established as a reagent for the detection and determination of small quantities of some metals. Some account is here given of its application to the detection and determination of Pb, Hg, Ag, Cu, Zn, Bi, Cd, Co, and Au.

10-16. **Photoelectric Colorimetry.** E. C. Pigott. *Iron & Steel,* v. 17, March '44, pp. 285-288.

Use of photocells in quantitative metallurgical analysis.

10-17. **An Application of the Spectrograph to the Inspection of Fabricated Iron and Steel.** H. F. Kincaid. *Optical Society of America Journal,* v. 34, March '44, pp. 141-146.

The spectrographic equipment in use at Farmall Works of the International Harvester Co. The operating technique and results obtained, with particular attention to the various controllable conditions which affect accuracy of results.

10-18. **A Combined Method of Chemical Analysis for Cast Iron, Malleable Iron and Steel.** Winfield B. Sobers. American Foundrymen's Association Preprint No. 44-1, April '44, 8 pp.

A combined chemical analysis routine for plain and alloyed cast iron, malleable iron and steel, has resulted in time saving for completing a number of determinations, as well as in the handling and weighing operations of the sample itself.

10-19. **Spectrographic Analysis of Iron and Steel.** H. F. Kincaid. American Foundrymen's Association Preprint No. 44-10, April '44, 12 pp.

A successful commercial installation and its operation are described. Influence of length of preburn, humidity changes, size of sample, etc., on the accuracy of spectrographic analysis is discussed in detail with experimental data. The analytical procedure involves the use of a single iron reference line for the quan-

titative determination of manganese, chromium, nickel, molybdenum, vanadium, copper, aluminum, and silicon in steel. The same technique is used for the quantitative determination of Si and Mn in gray iron foundry control work and in the testing of miscellaneous castings. Tables illustrating the lines used, excitation conditions, developing procedure, and the accuracy to be expected of the quantitative determination of five elements from a single spectrogram are presented.

10-20. **Chemical Analysis by Powder Diffraction.** Ludo K. Frevel. *Industrial and Engineering Chemistry,* Analytical Edition, v. 16, April '44, pp. 209-218.

Examples of use of the powder diffraction method in the chemical identification of solids, and some of the general difficulties that may be encountered in its use. 63 ref.

10-21. **Determination of Carbon by the Low Pressure Combustion Method.** W. M. Murray, Jr. and S. E. Q. Ashley. *Industrial and Engineering Chemistry,* Analytical Edition, v. 16, April '44, pp. 242-248.

Apparatus redesigned to increase the speed of manipulation. Detailed description of the equipment and its manipulation, together with an account of experimental studies on the method. Results are also shown for the carbon content of copper. 13 ref.

10-22. **Determination of Carbon in Low-Carbon Steel.** R. W. Gurry and Hastings Trigg. *Industrial and Engineering Chemistry,* Analytical Edition, v. 16, April '44, pp. 248-250. 2 ref.

The precision of the low pressure combustion method described appears to be at least three times that of the standard combustion method when used on low carbon steel. Its accuracy, as determined by direct calibration on Iceland spar, is about 0.0007% carbon, again about three times that of the standard combustion method. 2 ref.

10-23. **Colorimetric Determination of Tin with Silicomolybdate.** Irvin Baker, Martin Miller, and R. Stevens Gibbs. *Industrial and Engineering Chemistry,* Analytical Edition, v. 16, April '44, pp. 269-271. 17 ref.

A rapid and accurate colorimetric determination of tin, for concentrations ranging from 0.0005 to 0.5%. The method is an excellent routine procedure requiring no special technique or apparatus other than a comparator or filter photometer. 17 ref.

10-24. **Micro-Analysis and the Railway Chemist.** G. H. Wyatt. *Metallurgia,* v. 29, March '44, pp. 273-275.

The railway chemist must be equipped to cope with diverse analytical demands. The many valuable directions in which microchemical methods of analysis have been developed are clearly illustrated by this account of some of the ways in which a railway chemist has been able to solve his problems. 10 ref.

10-25. **Identification of Metallic Minerals.** *Mine and Quarry Engineering,* v. 9, April '44, pp. 81-86, 97.

Determination and localization of ore constituents with special reference to the contact print method and its applications.

10-26. **Spotting Cobalt High Speed.** A. J. Scheid, Jr.; George A. Roberts. *Metal Progress,* v. 45, May '44, pp. 903-904.

Distinguishing high speed steel containing cobalt by appearance of scale and by drop of concentrated hydrochloric acid.

10-27. **Photoelectric Colorimetry.** E. C. Pigott. *Iron & Steel,* v. 17, April '44, pp. 319-322.

Use of photocells in quantitative metallurgical analysis.

10-28. **Organic Reagents in Quantitative Metallurgical Micro-Analysis—Part I.** R. Belcher and C. E. Spooner. *Metallurgia,* v. 29, April '44, pp. 329-332.

The theory underlying the application of organic reagents to micro-metallurgical analysis is summarized. Particular attention is directed to compounds in which some of the principles of complex formation are indicated. A subsequent article will review some of the more recent practical methods by which these compounds have been utilized in the micro-determinations of metal.

10-29. **General Methods of Micro-Chemical Analysis of Metals.** I. H. Hadfield. *Metal Treatment,* v. 11, Spring '44, pp. 19-28.

Describes the early attempts at micro-chemical analysis. Modern qualitative and quantitative determinations, including gravimetric and volumetric processes. 19 ref.

10-30. **Recommended Methods for the Determination of Silicon in Acid-Resisting High-Silicon Irons.** *Journal Society of Chemical Industry,* v. 63, Feb. '44, pp. 63-64.

Precautions to be observed in the analysis of this material are set out and recommended methods for umpire and routine analysis are described.

10-31. **Surface Measurement by van der Waals Adsorption.** A. M. Gaudin and F. W. Bowdish. *Mining Technology,* v. 8, May '44, T.P. 1666.

Determining the amount of nitrogen that is adsorbed by a given sample of solid at the temperature of boiling nitrogen. The more surface there is on the solid—both internal and external—the more nitrogen is abstracted. 10 ref.

10-32. **Colorimetric Determination of Nickel in Steel.** C. G. Hummon. *Steel,* v. 114, June 19, '44, p. 97.

Filters, solutions, procedure.

10-33. **Colorimetric Methods for the Analysis of Magnesium-Base Alloys.** V. A. Stenger. American Society for Testing Materials Preprint 38, June '44, 7 pp.

Analysis of magnesium alloys with the aid of a photoelectric colorimeter (filter photometer) or spectrophotometer.

10-34. **Colorimetric Methods for the Analysis of Copper-Base Alloys.** C. Zischkau. American Society for Testing Materials Preprint 39, June '44, 7 pp.

The methods presented in this paper have been assembled from various sources and represent procedures that have been found suitable by the submitters, for

the colorimetric determination of certain elements in copper-base alloys.

10-35. **Photoelectric Colorimetry.** E. C. Pigott. *Iron & Steel,* v. 17, May '44, pp. 363-364, 366.
Use of photocells in quantitative metallurgical analysis. 74 ref.

10-36. **Pig Iron.** *Iron & Steel,* v. 17, May 18, '44, pp. 413-414.
Standard analytical methods for sulphur and phosphorus.

10-37. **The Rapid Photometric Determination of Beryllium in Beryllium-Containing Minerals and Rocks.** G. H. Osborn and W. Stross. *Metallurgia,* v. 30, May '44, pp. 3-6.
Accurate and reproducible analyses are rapidly obtained. The method described.

10-38. **Organic Reagents in Quantitative Metallurgical Micro-Analysis—Part II.** R. Belcher and C. E. Spooner. *Metallurgia,* v. 30, May '44, pp. 49-52.
Theoretical principles underlying the application of organic reagents to inorganic analysis. Practical applications to the micro-analysis of metals. Methods for the micro-determination of silver, lead, copper, antimony, tin, aluminum, iron, nickel, zinc and magnesium are reviewed together with brief reference to other metals and special techniques.

10-39. **Ultra-Violet Light.** Thomas S. Warren. *Mines Magazine,* v. 34, June '44, pp. 278-279, 282-284, 290.
Ultra-violet rays cause certain minerals to glow, a phenomenon called fluorescence, which has been taken advantage of in the identification of many minerals.

10-40. **Determine Sulphur in Brass and Bronze by Combustion Method.** Albert C. Holler and James P. Yeager. *The Foundry,* v. 72, August '44, pp. 83, 208, 210, 212.
Three steps in method: (1) Oxidation of the sulphides to sulphur dioxide; (2) formation of sulphuric acid; (3) titration of the sulphuric acid formed with a standardized sodium hydroxide solution. 12 ref.

10-41. **The Determination of Sulphur in Cast Iron by the Combustion Method.** W. J. Roskrow. *Foundry Trade Journal,* v. 73, July 6, '44, p. 198.
Reagents, method.

10-42. **Determination of Zinc in Aluminum Alloys.** W. Stross and G. H. Osborn. *Light Metals,* v. 7, July '44, pp. 323-327.
Comparative studies of electrolytic and polarographic determinations of zinc in aluminum alloys, particularly those of lower zinc content. 21 ref.

10-43. **Recent Developments in Analytical Chemistry-X.** *Chemical Age,* v. 50, June 24, '44, pp. 595-598.
Electrochemical deposition; determining copper in ore; polarography of copper, other methods for copper; spectrography; the mass spectrometer; rubber analysis. 38 ref.

10-44. **Colorimetric Determination of Chromium in Steel.** Louis Singer and Walter A. Chambers. *Industrial & Engineering Chemistry,* Analytical Ed., v. 16, August '44, pp. 507-509.

A method based on the fact that ferric perchlorate, which is itself colorless, intensifies the color of the dichromate ion. The method is not subject to interference by iron or usual alloying constituents. 2 ref.

10-45. **On Plate Calibration in Spectrographic Analysis.** Saul Levy. *Optical Society of America, Journal,* v. 34, August '44, pp. 447-454.

Methods of photographic photometry; analytical representation of the characteristic curve; characteristic curves for plates of different contrasts; procedure for obtaining the basic curve; selections of lines; some experimental results.

10-46. **Spectrographic Determination of Trace Elements in 70/30 Brass and Admiralty Brass. I.** P. A. Leichtle. *Optical Society of America, Journal,* v. 34, August '44, pp. 454-463.

A spectrographic procedure for the simultaneous determination of Pb, Fe, Ni, Sn, Bi, and Sb in 70/30 brass and admiralty brass.

10-47. **Micro-Electrolytic Methods of Chemical Analysis.** Henry J. S. Sand. *Metallurgia,* v. 30, June '44, pp. 107-109.

Deposition of metals from electrolytic solutions on passage of an electric current has been used to afford a means of gravimetric analysis. A number of the methods which have proved valuable on the ordinary laboratory scale adapted to the detection and determination of minute amounts of metals.

10-48. **Quantitative Spectrographic Analysis of Copper Alloys.** R. A. Wolfe and Emile J. Jemal. American Society for Testing Materials *Bulletin,* no. 129, August '44, pp. 45-52.

Elements largely determined at the 10% level, but an occasional analysis made with contents as high as 25%. Spectrographic sources discussed and a new type spark source suggested. Various details of the problem, such as errors due to sampling and corrections on the analyses due to interfering substances considered. Examples of working curves included.

10-49. **Colorimetric Method for Determining Phosphorus in a Combined Form of Analysis.** W. B. Sobers. *American Foundryman,* v. 6, Sept. '44, pp. 2-4.

Colorimetric methods of analysis, using optical or photometric methods to compare colors of solutions, offer economical methods for the average metallurgical control laboratory.

10-50. **Identifying Nickel in Aluminum Alloys.** L. J. Hibbert. *Metal Progress,* v. 46, Sept. '44, pp. 486-487.

Equipment and process for reliable methods for discriminating between non-ferrous metals of similar color and hardness, yet of different composition.

10-51. **To Indentify Cadmium, Tin and Zinc Coatings.** Birger L. Johnson. *Metal Progress,* v. 46, Sept. '44, p. 484.

Rapid methods of distinguishing metals by immersing the sample in a solution of one part commercial hydrochloric acid and one part water.

10-52. **Spectrographic Analysis of Iron and Steel.** H. F. Kincaid. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 248-260.

Commercial grating spectrograph and the use of the flat surface method of sampling. Tables illustrating the lines used, excitation conditions, developing procedure, and the accuracy to be expected of the quantitative determinations of five elements from a single spectrogram are presented.

10-53. **Analysis by Internal Electrolysis—A Semi-micro Method.** James G. Fife. *Metallurgia,* v. 30, July '44, pp. 167-169.

Electrolytic methods, as adapted to dealing with small quantities of material. Interesting development is based on the deposition of metal without the use of an external current.

10-54. **Microchemistry and its Borderline: The Instrument as an Analytical Tool.** David L. Masters. *Metallurgia,* v. 30, July '44, pp. 169-170.

Microchemistry is now becoming so highly developed that a complete grasp of all the instrumental methods, which it must be held to include, is beyond the grasp of the average practitioner. Specialization, the obvious solution, will necessitate some readjustment of the system of using consultants.

10-55. **Spectrography Makes Strides.** *Scientific American,* v. 171, Oct. '44, p. 153.

Flat-surface sparking technique.

10-56. **The Rare Earths.** R. C. Vickery. *Metallurgia,* v. 30, August '44, pp. 215-220.

Present position of the chemistry of the rare earth elements. Their nature is summarized and a general account given of methods of separation, identification and determination. Existing problems are considered, and many references to original work are given.

10-57. **Amperometric Titration. I.** J. T. Stock. *Metallurgia,* v. 30, August '44, pp. 221-224.

Amperometric titrations are directly derived from polarographic methods. These titrations have been applied with some success to a variety of inorganic estimations, using both inorganic and organic reagents. They have most of the advantages of the polarographic technique, and can be used to determine extremely small quantities of metallic ions.

10-58. **Fundamentals of Spectrographic Analysis.** H. M. P. Brinton. *Mining Journal,* v. 28, Sept. 30, '44, pp. 4-5.

Discussion of the subject for the layman.

10-59. **Modifications of Spectrographic Methods for Analysis of Aluminum and Its Alloys.** R. W. Callon and

J. E. Burgener. Optical Society of American *Journal,* v. 34, Sept. '44, pp. 543-549.

Standard equipment; special equipment; standard procedures; accuracy.

10-60. **Recent Developments in Analytical Chemistry—XII.** *Chemical Age,* v. 51, Sept. 16, '4, pp. 269-273.

Potassium; calcium; a polarographic method; tungsten; germanium; spectrographic analysis; electrode improvements; inorganic chromatography. 40 ref.

10-61. **The Spectrographic Determination of Calcium in the Presence of Large Quantities of Magnesium.** C. H. Wood. *Society of Chemical Industry Transactions,* v. 63, Aug. '44, pp. 253-256.

A method is described for the spectrographic determination of calcium in magnesia by means of the high-voltage spark which gives results accurate to within ±2.5% in the range 2 to 8% CaO. The method is based on the impregnated electrode technique, a nickel salt solution being used to give an auxiliary spectrum.

10-62. **Determination of Copper in Aluminum and Magnesium Alloys.** *Metallurgia,* v. 30, Sept. '44, p. 274.

Internal electrolysis without the use of a diaphragm to separate the anode and cathode compartments.

10-63. **Amperometric Titration, II.** J. T. Stock and M. A. Fill. *Metallurgia,* v. 30, Sept. '44, pp. 277-280.

Apparatus and general technique.

10-64. **The Mass Spectrometer.** E. D. Hart. *Electronic Engineering,* v. 17, Oct. '44, pp. 185-188.

A new electronic aid to analysis. 16 ref.

10-65. **Carbon and Sulphur Determinators.** *Steel,* v. 115, Nov. 27, '44, p. 93.

Faster, more accurate, and simpler testing system for all steel, iron, non-ferrous metals and coal and coke.

10-66. **Nitrogen.** S. D. Steele. *Iron & Steel,* v. 17, Nov. '44, pp. 669-670.

Determination in mild steel by a semi-micro method.

10-67. **Spectrographic Work in an Engineering Laboratory.** J. Arnott. *Metallurgia,* v. 30, Oct. '44, pp. 300-304.

If the chemical method is long and laborious, the spectrographic method is recommended. Application of this method to solve the difficult day to day problem. 2 ref.

10-68. **The Application of Diffusion to Micro-Analysis.** G. H. Wyatt. *Metallurgia,* v. 30, Oct. '44, pp. 329-332.

Attention to the proper design of apparatus has made possible accurate quantitative diffusion analysis with minute amounts of evolved gases.

10-69. **Investigations on the Influence of Sampling on the Nitrogen Content of Unalloyed Steels.** H. Kempf and A. Neuberger. *Archiv für das Eisenhüttenwesen,* v. 17, July-August '43, pp. 5-9. Abstract Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 164-A.

It is known that steel when heated will take up nitrogen. Thus, steel at the surface of machined specimens, where it has been heated by friction, has been found to be considerably higher in nitrogen than samples

from below the surface. This paper reports on investigations of the nitrogen content of basic bessemer mild steel, basic bessemer rail steel and open-hearth steel, the samples being taken from many different positions in billets and rails. The results proved that, in the drilling of samples, temperatures up to about 300° C. made practically no difference to the amount of nitrogen determined. The results were also the same whether coarse or fine drillings were used.

10-70. **Determination of Tin in Non-Ferrous Metals by Distillation as Bromide and Precipitation with Cupferron.** William D. Mogerman. *Journal of Research,* v. 33, Oct. '44, pp. 307-314.

Gravimetric method for the determination of tin in copper-base and lead-base alloys. Procedure involves separation of the tin by distillation, precipitation with cupferron, and ignition to stannic acid. Results obtained by applying the method to known amounts of tin and to a number of non-ferrous alloys, show that an accuracy to 0.2 mg can be expected for amounts of tin ranging from 0.05 to 0.24 g. 11 ref.

10-71. **Spectrograph Speeds Analysis Work in New Allis-Chalmers Laboratory.** G. W. Birdsall. *Steel,* v. 115, Dec. 25, '44, pp. 73, 112, 114.

Use of the spectrograph as a device for quantitative as well as qualitative checks.

SECTION XI

LABORATORY APPARATUS, INSTRUMENTS

11-1. Designing Electronic Control Devices. W. D. Cockrell. *Machine Design,* v. 16, no. 1, Jan. '44, pp. 140-144.

Rectifiers, the electronic amplifier, oscillators, gas-filled tubes, plasma potential, and electronic-control circuits.

11-2. A Metallurgical Study of Enemy Aircraft Components. *Metal Industry,* v. 63, no. 25, Dec. 17, '43, pp. 395-396.

Investigations on various control units. A wide range of materials has been employed for both bellows and capsule types of units. Beryllium copper was used in one instrument only out of eleven examined, and also for Bourdon gauge tubing, but otherwise materials correspond closely with those used in British instruments.

11-3. New Gage System. G. W. Birdsall. *Steel,* v. 114, no. 2, Jan. 10, '44, pp. 74-75.

Measures any angle from zero to 103° at 1-sec. intervals with an accuracy of ¼ sec.

11-4. Electrolytic Polishing of Metallographic Specimens. L. A. Hauser. *Iron Age,* v. 153, no. 3, Jan. 20, '44, pp. 48-54.

Smooth, scratch-free surfaces are produced with no disturbed metal. To encourage use of this rapid and economical polishing method, detailed data on the apparatus and procedures are presented.

11-5. A Compact High Resolving Power Electron Microscope. V. K. Zworykin and James Hillier. *Journal of Applied Physics,* v. 14, no. 12, Dec. '43, pp. 659-673.

Needed qualities in electron microscope, experimental design of a small electron microscope, specimen stage, lens and vacuum system, and power supplies.

11-6. Magnification Calibration of the Electron Microscope. Ernest F. Fullan. *Journal of Applied Physics,* v. 14, no. 12, Dec. '43, pp. 677-683.

Magnification calibration of the electron microscope to compensate for the calibration errors caused by mechanical and electrical variation of the instrument. Microscopic glass spheres of predetermined size, mounted directly on the specimen supporting film.

11-7. **Magnetic Comparator.** *Business Week,* no. 751, Jan. 22, '44, p. 69.

New instrument to control quality of ferrous parts by detecting differences in heat treatment, composition, hardness, size or other properties which affect behavior in a magnetic field.

11-8. **Wax Impregnated Broadcloth Superior for Rough Polishing.** Louis A. Nowell, Jr. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 89-90.

Broadcloth dipped in melted paraffin and treated with levigated alumina containing a small quantity of liquid soap to make the solution adhere to the wax.

11-9. **Normal Sections of Fine Wire.** R. G. Sartorius. *Metal Progress,* v. 45, no. 1, Jan. '44, p. 90.

Method for mounting 0.00445-in. resistance wire for microscopic examination of roundness.

11-10. **Electronics—an Important Aid in the Processing of Steel.** Carl J. Madsen. *Steel Processing,* v. 30, no. 1, Jan. '44, pp. 25-28.

Developments of electronics explained by breaking down the application into nine classifications: Rectification, inversion, high frequency heating, communications, measurements, control, inspection and sorting, precipitation, radiation.

11-11. **Electron Tube—Genie, Gremlin, or Jeep?** W. D. Cockrell. *Industry & Welding,* v. 17, no. 1, Jan. '44, pp. 60, 62, 73-80.

Types of electron tubes and their uses.

11-12. **Accuracy and the Geometry of Precision.** E. Willard Pennington. *Tool & Die Journal,* v. 9, no. 10, Jan. '44, pp. 99-101.

Precision, workmanship, methods and tools.

11-13. **Electron Diffraction.** G. P. Thompson. *Canadian Metals & Metallurgical Industries,* v. 7, no. 1, Jan. '44, pp. 25-27.

Particularly applicable to study of polished layer on metals, lubrication of metals, and formation of crystals and compounds.

11-14. **Polishing Soft Steel (Cartridge Cases).** Robert F. Nelson. *Metal Progress,* v. 45, no. 2, p. 297.

Method which avoids pitting when polishing for metallographic examination.

11-15. **The Electron Tube — Genie, Gremlin or Jeep?** W. D. Cockrell. *Blast Furnace and Steel Plant,* v. 32, Feb. '44, pp. 235-238, 240. Also *Industry and Welding,* v. 17, Feb. '44, pp. 56, 58.

Definition of electron tubes; types of tubes; how the tubes work.

11-16. **Corrective Feed Water Treatment.** W. D. Vint. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 211-213.

Automatic control by means of pH instruments.

11-17. **The Ten-Thousandth Feeler-Gauge System.** H. H. *Machinery (London),* v. 64, Jan. 6, '44, pp. 9-10.

Devision of a system of gaging and tool setting with the aid of feeler gages by the firm of Nuttall Engineering, Sydney, Australia.

11-18. **Gaseous Diffusion as a Tool for Locating Critical Points in Metals and Alloys.** Howard S. Coleman and Henry L. Yeagley. *Journal of Applied Physics,* v. 15, Feb. '44, pp. 125-127.

The rate at which a diatomic gas diffuses through the metal disk into a vacuous space depends upon the pressure and the temperature. 6 ref.

11-19. **Roll Pressure Measurement by Means of an Electric Strain Gage.** D. W. Redepenning. *Engineers' Digest,* Feb. '44, pp. 174-175.

Determination of the measurement of the rolling pressure important for controlling the physical properties of final rolled product. Description.

11-20. **Surface Replicas Containing Dye for Use in the Light Microscope.** Vincent J. Schaeffer. *Metal Treatment,* v. 10, Winter, '43-'44, pp. 263-265.

The use of replicas as a permanent record of the structure which may be destroyed as a result of further work on a specimen under examination.

11-21. **Time Saver in Dark Room.** J. I. Crabtree. *Metal Progress,* v. 45, March, '44, p. 512.

Silver plated copper coil, through which cold water is circulated for cooling developer solutions.

11-22. **Electronic Circuit Maintains Edge-Control on Moving Strip.** *Product Engineering,* v. 15, March '44, p. 157.

Simplified circuit for electronic edge control that works without touching the material or relying on moving parts.

11-23. **Equivalent Circuits of the Electromagnetic Field.** J. F. McAllister. *General Electric Review,* v. 47, March '44, pp. 9-14.

Methods of analyzing complex circuit problems by construction of equivalent circuits.

11-24. **High-Speed Photolight.** S. L. Bellinger. *General Electric Review,* v. 47, March '44, pp. 31-33.

Readily portable and compact; lamp is capable of emitting thousands of brilliant flashes during its lifetime. The equipment is valuable in studying high-speed motion.

11-25. **Forecasting Tool and Gage Requirements.** Sergius D. Brootskoos. *Iron Age,* v. 153, March 16, '44, pp. 68-72.

Procedure that should be followed when using the author's formulas in setting up gage purchases. An example shows how the rules of tool and gage procurement are applied to a broaching operation in which the number of broaches in use and those held in reserve are accurately determined.

11-26. **Recording and Indicating Instruments for Steel Mill Service.** P. E. Twiss and R. M. Powell. *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 356-357.

Application and description.

11-27. **High-Speed Movement.** *Aircraft Production,* v. 6, March '44, pp. 125-128.

New stroboscope tachometer and photographic equipment for studying machine performance.

11-28. **Automatic Control: Its Practical Application—Parts III and IV.** W. H. Steinkamp. *Chemical Industries,* v. 54, March '44, pp. 372-376, 445.

The types of electrically operated controls and their principles of operation. Some modern uses of automatic control in distillation and metal coating work.

11-29. **A New Electronic Relay Method.** Joseph Razek. *Instruments,* v. 17, March '4, pp. 132-133, 162.

Method and operation of electronic tube used as a relay.

11-30. **New Electromagnetic Method of Measuring Screw-Thread Leads to a Few Millionths of an Inch.** H. T. Rights. *Instruments,* v. 17, March '44, pp. 134-135.

To solve the problem of precise lead measurement, Sheffield Corp. and Westinghouse Electric & Mfg. Co., have developed an electrical lead-measuring method.

11-31. **Electron Tubes—Their Principles and Their Instrumentation Applications.** Andrew W. Kramer. *Instruments,* v. 17, March '44, pp. 138-143, 156, 158.

Development of the electron-tube oscillator.

11-32. **The Measurement of Large Ring Screw Gauges.** J. W. Drinkwater. *Machinery (London),* v. 64, March 2, '44, pp. 238-240.

The horizontal Omtimeter is an optical comparator arranged for measurement in a horizontal plane.

11-33. **A Portable Bond Tester for Journal Bearings.** E. A. Wolfenden. *Metals & Alloys,* v. 19, March '44, pp. 608-609.

A new portable car journal bearing-bond tester that has made possible note-worthy improvement in railroad journal bearings and the practical elimination of bond failures for at least one road. It supplements the hammer-and-ring test, shown to be meaningless insofar as the bond strength is concerned.

11-34. **Chemical Analysis by Electron Microscopy.** *Electronic Industries,* v. 3, April, '44, pp. 110-111.

Slowing up of electrons as they pass through test specimen measured and reveals its atomic structure.

11-35. **Tubes in Metallurgical Research.** E. V. Potter. *Electronic Industries,* v. 3, April '44, pp. 112-114, 216-218, 220.

Describing electronic devices in laboratory work and control applications in industry. 3 ref.

11-36. **Automatic Control Equipment—II. Air Operated Controllers.** W. H. Steinkamp. *Industry & Power,* v. 46, April '44, pp. 72-73, 120.

Air-operated on-off controls, wide throttling range control, and wide throttling range with automatic reset.

11-37. **An Electronics Primer That Fills a Need.** C. T. Pearce. *Industry & Power,* v. 46, April '44, pp. 74-75.

Summarizes the answers to questions about electronics. Lists five common characteristics and seven basic advantages.

11-38. **Machine Shop "Magic".** H. H. Slawson. *Modern Machine Shop,* v. 16, April '44, pp. 176-178, 180, 182, 184-186, 188, 190, 192.

Properly harnessed, a beam of light can be made to do the work of a safety guard, a starting or stopping lever, a temperature control instrument, a counter, or an inspector on quality or quantity, and do it better.

11-39. **Fundamentals of Industrial Electronics.** G. M. Chute. *Steel*, v. 114, April 3, '44, pp. 112-113, 148, 150, 152, 154, 156.

Principles of electronic tubes and their application.

11-40. **Fundamentals of Industrial Electronics.** G. M. Chute. *Steel*, v. 114, April 10, '44, pp. 100-101, 115, 142, 144, 146, 148-151.

Functioning of three-element tube used in relays for controlling many industrial processes, including injection molding, timing of machining and heat treating operations, rivet-heating and the like. Shows how electronic tubes can operate in practical circuits.

11-41. **Application of Electron Microscope to Study of Aluminum Alloys.** F. Keller and A. H. Geisler. *Metals Technology*, v. 11, April '44, Tech. Pub. 1700, 17 pp.

Results obtained in revealing the fine structure of various aluminum alloys by employing the electron microscope are considered encouraging. Many of the structures shown in this paper are far beyond resolution by the optical microscope. Available methods for preparing specimens are compared and a new method described. 37 ref.

11-42. **Tips on Trouble Shooting Electronic Controls.** W. D. Cockrell. *Welding Engineer*, v. 29, April '44, pp. 45-47.

Practical production equipment to be kept in tip-top operating condition.

11-43. **Fundamentals of Industrial Electronics.** G. M. Chute. *Steel*, v. 114, April 17, '44, pp. 108, 111, 112, 114, 144, 146.

Functioning of photoelectric relay and its applications ranging from simple counting devices to more complicated motor-reversing apparatus.

11-44. **Electronic Torque Control Prevents Drill Breakage.** *Iron Age*, v. 153, April 13, '44, pp. 66-67.

To avoid excessive drill breakage on a deep hole drilling operation, development of an electronic control that automatically backs out the drill when torque exceeds a given amount.

11-45. **Electronic Control Speeds Production.** H. G. Grondahl. *Machine Design*, v. 16, April '44, p. 154.

Production of spar beams. Automatic control proves accurate and speeds production.

11-46. **X Marks the Spot.** Albert G. Ingalls. *Scientific American*, v. 170, April '44, pp. 163-165.

Account of the new hillier electron microanalyzer now undergoing development at the RCA laboratories. Related to the electron microscope. It serves a different end, the elemental analysis of minute samples of matter.

11-47. **Fundamentals of Industrial Electronics.** G. M. Chute. *Steel*, v. 114, April 24, '44, pp. 100, 102, 104, 124, 126, 128, 130.

How electronic tubes serve as alternating current switches to close or open circuits, including large power circuits.

11-48. Fundamentals of Industrial Electronics. G. M. Chute. *Steel,* v. 114, May 1, '44, pp. 120, 123, 126, 128, 152-154.

Electronic control of heat applied by resistance welders. Phase-shift circuit makes it possible to change quickly and accurately the amount of weld current through the primary of transformer.

11-49. Fundamentals of Industrial Electronics. G. M. Chute. *Steel,* v. 114, May 8, '44, pp. 126, 128, 130, 132, 163-164, 167.

High speed photo-electric relay which can operate on changes in light lasting only one-thousandth of a second and is useful for such applications as fast, precision cutoff machines.

11-50. Tubes in Metallurgy-II. E. V. Potter. *Electronic Industries,* v. 3, May '44, pp. 115-117, 288, 290.

Details of sonic flocculating apparatus, magnetic property analysis and chemical measuring equipment.

11-51. Automatic Control Equipment III — Electrically Operated Controls. W. H. Steinkamp. *Industry & Power,* v. 46, May '44, pp. 71-73, 87.

Explains two-position and floating control motors, the various developments in proportioning controls—such as triple-function reset—and electrical input controllers.

11-52. Electronics for the Machine Designer. G. A. Caldwell and Carl Madsen. *Machinery,* v. 50, May '44, pp. 135-150.

Fundamentals of electronics and the ways in which electronic devices can be advantageously applied in the mechanical field.

11-53. An Inexpensive Photometer for Metallographers. P. A. Haythorne and R. W. Powell. *Iron Age,* v. 153, May 11, '44, pp. 66-69.

Photometer arrangement of low cost especially adapted to metallographic functions. Use of the equipment saves time and furnishes consistently uniform and well exposed negatives.

11-54. Fundamentals of Industrial Electronics. G. M. Chute. *Steel,* v. 114, May 15, '44, pp. 121, 124, 126, 146, 148, 150, 152, 154, 156, 158.

Application of electronics in providing stepless controls over motor speeds.

11-55. The Theory and Design of Electronic-Control Apparatus. W. D. Cockrell. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 249-258.

Explanation of theory and design of electronic apparatus. The almost infinitely fast and inertialess electronic tube can supplement mechanical control. Fundamental conceptions of the electronic tube, describing the types of tubes used and the operation of individual control circuits. Practical applications.

11-56. Application of Electronic Control. E. H. Vedder. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 259-264.

Motor controls including an adjustable-speed drive for direct-current motors and a speed-regulator system are shown. The importance of resistance welding in production of sheet-metal assemblies and the use of ignitron equipment for control of time and current are discussed. Pinhole detection in steel strip.

11-57. Air or Gas Measurement. *Iron & Steel,* v. 17, April '44, p. 318.

Instrument made by Walker, Crosweller & Co., Ltd., is claimed to have a number of advantages, especially for measuring large flows of gas, being of light weight, simple construction, and equally applicable to any diameter pipe and rate of flow, while it is not affected by pulsations, and dirty gas containing dust particles can be measured just as well as ordinary purified gas.

11-58. Electronic Devices Aid Metallurgical Research. E. V. Potter. *Electrical Engineering,* v. 63, May '44, pp. 175-185.

Electronic devices for temperature measurement and control, length and displacement measurements, and magnetic testing, and in induction furnaces and chemical and spectrographic analyses. 7 ref.

11-59. Fundamentals of Industrial Electronics. G. M. Chute. *Steel,* v. 114, May 22, '44, pp. 97-98, 100, 102, 142, 144.

Electronic heater. Induction long used in industry; in lower frequencies but more recent applications require power above 400,000 cycles per sec.

11-60. Electron Microscopic Determination of Surface Elevations and Orientations. R. D. Heidenreich and L. A. Matheson. *Journal of Applied Physics,* v. 15, May '44, pp. 423-435.

The methods of determining object thickness in electron microscopy. Uncertainties in interpretation of surface replicas from a consideration of intensities alone are discussed and three different replicas of etch figures in pure aluminum are presented. 18 ref.

11-61. A New "Instrumentation-Type" Air Gaging Method for Automatic Control of Machine Tools. Clarence Johnson. *Instruments,* v. 17, May '44, pp. 256-257, 304.

Instrumentation principles utilized in method disclosed, the purpose of which is to make possible extreme accuracy of repetition (within 0.0002 in.) in the automatic operation of certain types of tools.

11-62. Electric Gaging Methods for Strain, Movement, Pressure and Vibration. Howard C. Roberts. *Instruments,* v. 17, May '44, pp. 260-265.

Gaging methods based on variations of capacitance. 37 ref.

11-63. Ordnance Production Gaging. R. A. Bowman. *Instruments,* v. 17, May '44, pp. 266, 282-284.

The gage laboratory—its personnel.

11-64. Electron Tubes—Their Principles and Their Instrumentation Applications. Andrew W. Kramer. *In-*

struments, v. 17, May '44, pp. 268-272, 288, 290, 292, 294, 296.

Principles of the phototube.

11-65. **One Laboratory Inspects Gages for Lend-Lease.** *American Machinist,* v. 88, May 25, '44, pp. 103-104.

Procurement, inspection and shipment of gages to Allied Nations is centered in the New York Ordnance District.

11-66. **The Use of the Spectroscope in Steelworks.** John Cameron. *West Scotland Iron & Steel Institute Journal,* v. 51, Part 2, 1943-44, pp. 15-27.

Use of the spectroscope in steel-works has already carved out for itself a large and useful field of application. Moreover, as improvements in technique occur, as they are bound to do, the spectroscope will occupy an even larger and more useful place in the equipment of modern and progressive steelworks. 11 ref.

11-67. **Electronics as a Measurement Tool Accelerates Scientific Progress.** H. Johnston. *Industry & Power,* v. 46, June '44, pp. 58-60.

Far surpassing the sensitivity of human sight, hearing, and touch, electronic measuring instruments help control the quality of products being manufactured, safeguard employes, and improve working conditions.

11-68. **Electrical Strain Gauging.** C. G. A. Woodford. *Aircraft Production,* v. 6, May '44, pp. 245-249.

Methods of winding, wire material, strain sensitivity, circuit arrangements, static testing.

11-69. **Mercury-Arc Rectifier.** W. C. White. *General Electric Review,* v. 47, June '44, pp. 9-13.

Beginnings of this form of electron tube featuring the pool cathode.

11-70. **Electric Controls for Present and Post-War Products.** *Product Engineering,* v. 15, June '44, 16 pages opposite 392.

An editorial summary of developments in electric controls for industrial, domestic and aircraft accessory applications, with reference to mechanical and electrical characteristics.

11-71. **The Electron Tube—Genie, Gremlin or Jeep?** W. D. Cockrell. *Mining Congress Journal,* v. 30, May '44, pp. 41-43, 54.

Description of the fundamental principles of one of industry's newest aids.

11-72. **The Electron Microscope.** W. Wilson. *Metal Treatment,* v. 11, Spring '44, pp. 3-13.

Principles, construction and applications. 2 ref.

11-73. **Gaging Systems.** C. D. Wright. *Tool Engineer,* v. 13, June '44, pp. 70-74.

Study of three systems for a uniform gaging standard points to the best features of each and a possible combination of values to attain maximum interchangeability.

11-74. **Metallurgical Applications of the Eberbach Micro Hardness Tester.** Howard Edward Bernhardt. Thesis, University of Wisconsin, June 1944.

11-75. **Electronic Regulation of Industrial Processes.** S. L. Burgwin. *Instruments,* v. 17, June '44, pp. 328-330, 369.

Essential features, an interesting phototube application, amplification, stability.

11-76. **Electric Gaging Methods for Strain, Movement, Pressure and Vibration.** Howard C. Roberts. *Instruments,* v. 17, June '44, pp. 334-339.

Pick-up devices: variable-inductance type; push-pull types, mutual-inductance types, reluctance types; definitions, formulae, and theory. 10 ref.

11-77. **Electron Tubes—Their Principles and Their Instrumentation Applications.** Andrew W. Kramer. *Instruments,* v. 17, June '44, pp. 340-344, 354, 356, 358, 360, 362, 364, 366.

Photovoltaic cells, their characteristics and how they work, the Dynatron principle and the electron multiplier, the mercury-arc rectifier.

11-78. **Supersonics at Work.** *Scientific American,* v. 171, July '44, pp. 10-12.

Inaudible wave power is being used today to detect flaws and deviations in manufactured products, to measure underwater depths and distances, and to detect underwater objects such as fish. Principles have been developed which have interesting possibilities for future expansion.

11-79. **Electronics in Industry.** Carl J. Madsen. *Western Metals,* v. 2, June '44, pp. 48-52.

Development of electronics; definitions and applications.

11-80. **The Furth Microphotometer.** R. W. Pringle. *Electronic Engineering,* v. 16, May '44, pp. 512-513.

An improved form of an instrument which is entirely based on electronic principles. 4 ref.

11-81. **Precision Measurement.** *Automobile Engineer,* v. 34, May '44, pp. 208-210.

Optical instrument with the primary function of checking the angular relationship of plane surfaces. The three models available are briefly described, and details are given of a few of the applications.

11-82. **Control and Instrumentation.** John F. Black. *Canadian Metals and Metallurgical Industries,* v. 7, June '44, pp. 38-41, 56-57.

Pyrometrical laboratory; organization; gas producers; soaking pits; waste heat boiler and stoker fired boilers; gas-fired forge and press furnaces; car and rotary furnaces; gas-fired hood type, wire anneal furnaces; electric gun barrel, pit type furnaces; electric car furnace; electric tube-anneal, pit type furnaces; electric rod-hardening furnaces; electric salt bath annealing furnaces; electric tool pit furnaces; oil fired car furnaces; oil fired forge furnaces; oil fired rolling mill furnaces; oil fired continuous wire anneal furnace; oil fired continuous billet furnace.

11-83. **Electronics.** J. H. Hopper. *Steel,* v. 115, July 10, '44, pp. 106-108, 127.

Photoelectric relays, while differing in operating

characteristics and physical construction, are finding increased application in rolling mills particularly where a difficult limit-switch application is encountered. Pinholes in tinned strip as well as flow lines on electrolytic tin plate are detected by electronic equipment. Many mill problems are solved by use of electronic devices.

11-84. **Electronics in Review.** W. D. Cockrell. *Iron Age,* v. 154, July 20, '44, pp. 58-62.

Interprets the electronic tube as a tool comparable with tools of the trade, such as a milling cutter or a tungsten carbide bit. Describes electronic tube applications in terms that are part of the metal working field. Presents an imposing recapitulation of the new skills and savings that these applications have made possible.

11-85. **Electronics in Industry.** C. J. Madsen. *Iron & Steel Engineer,* v. 21, July '44, pp. 76-79.

Electronic tubes, handling currents ranging from thousands of amperes down to infinitesimal amounts, can amplify, generate, control, transform or convert electrical energy in almost any manner. Electronics, however, cannot do everything. Care should be exercised to avoid misapplication.

11-86. **The Anderometer.** Lucian Chaney, Edward Bragg, John Trytten, and Ernest Abbott. *Mechanical Engineering,* v. 66, August '44, pp. 515-518.

Instrument for production testing of ball bearings for deviations from circularity of balls and races.

11-87. **Electric Gaging Methods for Strain, Pressure and Vibration.** Howard C. Roberts. *Instruments,* v. 17, August '44, pp. 475, 484, 486, 488, 490.

Gaging methods based on variations of inductance.

11-88. **Electronic Counting.** Keith Henney. *Scientific American,* v. 171, Sept. '44, pp. 106-108.

A newly developed all-electronic counter.

11-89. **Role of the Thermal Conductivity Cell in Aircraft Instruments. I.** Michael A. Picciano. *Aero Digest,* v. 46, August 1, '44, pp. 108, 110, 144, 147.

The Fuel-Air Ratio Indicator makes it possible to ascertain the efficiency of the internal combustion engine to a degree which has never been matched by any other single instrument. 3 ref.

11-90. **A Closed Cell for Electron Microscopy.** I. M. Abrams and J. W. McBain. *Journal of Applied Physics,* v. 15, August '44, pp. 607-609.

Requirements for an enclosed chamber; preparation of collodion films; electron transparency of the film; mechanical mounting; liquid specimens in the electron microscope; Brownian movement and the electron microscope.

11-91. **Jewel Bearings for Aircraft Instruments.** Paul Grodzinski and W. Stern. *Aircraft Production,* v. 6, August '44, pp. 369-372.

Manufacturing methods employed in the U.S.A.

11-92. **Torquemeters Furnish Check on Machine Performance.** F. W. Godsey and B. F. Langer. *Machine Design,* v. 16, Sept. '44, pp. 135-138.

Better-known types of aircraft engine torquemeters and introduces a new design of magnetic coupled torquemeter that recently has come through its development stage.

11-93. **Electron Tubes—Their Principles and Their Instrumentation Applications.** Andrew W. Kramer. *Instruments,* v. 17, Sept. '44, pp. 532-533, 554, 556.

Tubes and their classification.

11-94. **Electric Gaging Methods for Strain, Movement, Pressure and Vibration.** Howard C. Roberts. *Instruments,* v. 17, Sept. '44, pp. 534-535, 544, 546, 548, 550, 552, 554.

Gaging methods based on variations of resistance.

11-95. **Wall Thicknesses.** *Iron & Steel,* v. 17, August '44, p. 565.

Instrument for accurate measurement of long tubes.

11-96. **Progress in Instrumentation.** Alexander Klemin. *Scientific American,* v. 171, Oct. '44, pp. 166-168.

The philosophy of instrument research. Should research be kept separate from production?

11-97. **Magnetic Materials.** I. F. Brailsford. *Electronic Engineering,* v. 17, Sept. '44, pp. 142-145.

Domain theory of ferro-magnetism.

11-98. **Light Alloys in Metal Rectifiers and Photocells.** *Light Metals,* v. 7, Sept. '44, pp. 437-438, 439-458.

Study of the selenium rectifier, and introducing a comprehensive discussion on photocells and the role of light metals in their construction.

11-99. **The Electron Microscope for Metals.** Robert G. Picard and Perry C. Smith. *Metals & Alloys,* v. 20, Sept. '44, pp. 636-641.

General description of the instrument, describes and illustrates some of its applications in metallographic work and an outline of its use in diffraction studies.

11-100. **The Application of Electronic Devices in the Mechanical Field.** G. A. Caldwell and C. Madsen. *Machinery* (London), v. 65, August 31, '44, pp. 225-231.

Review of the fundamentals of electronic theory, and some basic types of electronic devices.

11-101. **Electronic Control Applied to Grinding Machines.** R. A. Cole. *Machinery* (London), v. 65, Sept. 21, '44, pp. 321-323.

Four speed variables that require control: Wheel speed; work speed; infeed of the grinding wheel to the work and traverse speed. Advantages of electronic control.

11-102. **The Fundamentals of X-Ray Spectroscopy.** Donald F. Clifton. *Industrial Radiography,* v. 3, Summer, '44, pp. 19-22.

The work by physicists on the theory of X-rays and the structure of the atom is one of the two main applications of the instrument, the other being chemistry where it is used both on theoretical problems and as a means of analysis.

11-103. **Electron Induction Accelerator.** D. W. Kerst. *Industrial Radiography,* v. 3, Summer '44, pp. 36-39.

Operation and uses of the betatron.

11-104. **Electric Gaging Methods for Strain, Movement, Pressure and Vibration.** Howard C. Roberts, *Instruments,* v. 17, Oct. '44, pp. 603-605, 626, 628.

Gaging methods based on variations of resistance.

11-105. **Electron Tubes—Their Principles and Their Instrumentation Applications.** Andrew W. Kramer. *Instruments,* v. 17, Oct. '44, pp. 606-611, 618, 620, 622, 624, 626.

Tube data; amplifier classifications; electronics in the field of measurement.

11-106. **Determining the Thickness of Linings of Steel Plate.** N. M. Thornton. *Industrial Chemist,* v. 20, Sept. '44, pp. 466-468.

Describes an instrument which will determine the thickness of the protective lining from one side only, dispensing with the necessity for drill tests or removing sections of the lining for inspection.

11-107. **The Application of Electronic Devices in the Mechanical Field.** G. A. Caldwell and C. Madsen. *Machinery* (London), v. 65, Set. 7, '44, pp. 265-268.

Description of photo-, X-ray and cathode-ray tubes.

11-108. **Simple Interferometer for Surface-Quality Measurement.** L. Leinert. *Werkstattstecknik Der Betrieb,* v. 37/22, no. 7, July '43, pp. 279-280. *Engineers' Digest,* v. 1, Sept. '44, pp. 572-573.

Description of a simple instrument which has proved highly successful in industrial practices.

11-109. **A High-speed Dilatometer and the Transformational Behavior of Six Steels in Cooling.** Arthur L. Christenson, Edward C. Nelson, and Clarence E. Jackson. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1768, 17 pp.

High speed dilatometer which has sufficient range and accuracy to be useful in many metallurgical problems that depend upon continuous cooling behavior. 12 ref.

11-110. **Measuring and Designating Surface Finish.** James A. Broadston. *Iron Age,* v. 154, Oct. 26, '44, pp. 76-81.

Measurements of surface roughness by the Profilometer and the Brush Analyzer. Novel use is made of the Amsler integrator to determine precise RMS values from profile curves produced by either the taper section photomicrograph or the Brush Analyzer record tape.

11-111. **The Electron Microscope in Metallurgical Research.** Charles S. Barrett. *Journal of Applied Physics,* v. 15, Oct. '44, pp. 691-696.

This review limited to metallographic studies with the electron microscope, in which the surface details of a polished and etched metal specimen are transferred to a replica and made visible in a transmission electron microscope. 7 ref.

11-112. **Extending Microscopic Examination of Metals.** F. Keller and A. H. Geisler. *Journal of Applied Physics,* v. 15, Oct. '44, pp. 696-704.

The electron microscope used to investigate the

structure of aluminum and other alloys in a range far below the resolution of the light microscope. 11 ref.

11-113. **The Thickness of Electron Microscopic Objects.** Robley C. Williams and Ralph W. G. Wyckoff. *Journal of Applied Physics*, v. 15, Oct. '44, pp. 712-716.

Preliminary account of experiments made to determine the heights, or thicknesses, of certain objects under the electron microscope. Procedure for measuring heights based on shadow-casting developed. 8 ref.

11-114. **The Relationship of "Rheology" to "Strength of Materials."** A. C. Vivian. *Metallurgia*, v. 30, Sept. '44, pp. 237-240.

"Rheological" properties, flow properties, of all kinds of matter and materials.

11-115. **The Metallographic Examination of Aluminum-Rich Alloys.** N. H. Mason, G. J. Metcalfe and B. W. Mott. *Engineering*, v. 158, Oct. 13, '44, pp. 297-300.

The main equipment necessary for the preparation and microscopical examination of aluminum alloy specimens described, together with methods that have been found to give satisfactory results at the Royal Aircraft Establishment.

11-116. **Reflected Light in Metallurgy—IV.** E. Barber. *British Steelmaker*, v. 10, Oct. '44, pp. 436-439.

Choice of filters; mounting of specimens; the refractometer.

11-117. **Lighting for Photo-Macrography of Aluminum Alloys.** H. Chadwick. *Light Metals*, v. 7, Oct. '44, pp. 480-482.

Technical difficulties entailed in the photographing of large flat areas of metal which have been subjected to macro-etching. Experiments to determine a satisfactory lighting system for the purpose are described.

11-118. **Supersonic Measurement of Metal Thickness.** Wesley S. Erwin. *Iron Age*, v. 154, Nov. 9, '44, pp. 59-61.

High frequency sound waves have been utilized in the Sonigage to measure the thickness of metal sections where one of the surfaces is inaccessible. Instrument, first designed for inspection of hollow steel propeller blades, requires contact with only one surface of the object and little operating skill.

11-119. **Metallographic Examination of Aluminum Alloys.** *Canadian Metals & Metallurgical Industries*, v. 7, Oct. '44, pp. 40-41, 54.

Features of procedure adopted by Royal Aircraft establishments. 15 ref.

11-120. **Are Your Controls Properly Designed, Effectively Placed?** Harold Sizer. *Machine Design*, v. 16, Nov. '44, pp. 111-115.

Design and placement.

11-121. **Electronics Sets Standard for Automatic Control.** W. H. Gille and R. J. Kutzler. *Machine Design*, v. 16, Nov. '44, pp. 117-122.

Application of electronic control principles has made it possible to set new standards and to achieve full flexibility of control with completely automatic operation of all control functions.

11-122. **A Method for the Measurement of Surface of Finely Divided Material.** John W. Bell. *Canadian Mining & Metallurgical Bulletin,* no. 391, Nov. '44, pp. 424-436.

The essential features and general arrangement of the surface-meter.

11-123. **Electronic Controls.** Vin Zeluff. *Scientific American,* v. 171, Dec. '44, pp. 259-261.

Second-by-second measurements of gas content of air; constant supervision of rate of flow of liquid in a pipeline; and control of a specialized distillation system are only three examples of the possibilities of electronic control in everyday industrial operations.

11-124. **Instrument for Measuring Short Time Intervals.** *Journal of Scientific Instruments,* v. 21, no. 8, August '44, pp. 144-145. *Engineers' Digest,* v. 1, Oct. '44, pp. 613-614.

A large capacity condenser which has previously been charged by a high voltage d.c. supply, is discharged, during the time interval which it is proposed to measure, through a constant current circuit into a selected high-stability precision condenser.

11-125. **Electron Microscopy.** James Hillier. *Canadian Chemistry & Process Industries,* v. 28, Nov. '44, pp. 728-736.

Interpretation and significance of electron micrographs and newly developed techniques of utilizing the electron beam in various types of analysis.

11-126. **Fine-Pitch Spur Gears Checked by Simple Methods.** Charles Bullen. *American Machinist,* v. 88, Dec. 7, '44, pp. 104-105.

Measurement of pitch diameter, tooth thickness and tooth depth.

11-127. **Electron Microscopy.** Igor B. Benson. *General Electric Review,* v. 47, Dec. '44, pp. 6-14.

Progress in electrostatic art. Fundamentals and operating theory. Essential parts of electron microscope designs that simplify its use. 14 ref.

11-128. **The Microscope.** *Automobile Engineer,* v. 34, Nov. '44, pp. 475-482.

Application to metallurgical investigation.

11-129. **Electronic Aids to Research.** John Markus. *Scientific American,* v. 172, Jan. '45, pp. 19-21.

Pure and applied research alike find a multitude of uses for the electronic tube. From the laboratory to the workbench, electronics is making possible new accuracy in measurement and control. A survey of the field indicates virtually unlimited possibilities for applications of electronic tools.

SECTION XII

TESTING, INSPECTION AND RADIOGRAPHY

12-1. **Operating Temperatures and Stresses of Aluminum Aircraft Engine Parts.** E. J. Willis and R. G. Anderson. *S.A.E. Journal,* v. 52, no. 1, Jan. '44, pp. 28-36.

To study fatigue stresses, a hydraulically operated fatigue testing machine is used which can produce up to 100,000 lb. of load in either or both directions between the master piston and the bolster plate at 1300 cycles per min. Electric heaters, properly controlled, simulate operating temperatures of the piston.

12-2. **Dynamic Hardness Testing at Elevated Temperatures.** Erich Fetz. *Iron Age,* v. 152, no. 27, Dec. 30, '43, pp. 40-52.

Dynamic hardness at elevated temperatures of alloys in comparison with high speed steel and Stellite; hot hardness of low and high-alloy nickel-chromium steels, Stellite and Stellite substitute alloys with lower strategic metal content; dynamic hardness of brass, bronze and copper-aluminum with rising temperatures.

12-3. **Fatigue—the Forgotten Member of the Design Family.** H. O. Boyvey. *Aero Digest,* v. 44, no. 1, Jan. '44, pp. 74-76, 126-128, 133-136.

Static tests are insufficient as parts so tested frequently fail in service through fatigue; responsibility for and theory of failure, proper limit loads, plotting stress failure, rotary tension fatigue machine.

12-4. **An Engineering Approach to the Selection, Evaluation and Specification of Metallic Materials.** H. W. Gillett. *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 80, 82, 85-86, 88, 90.

Testing metals used for high temperature service presents problems not otherwise encountered where service conditions are less severe. Factors involved and conventional tests.

12-5. **Introduction to the Theory of Photo-Elasticity and Its Application to Problems of Stress Analysis.** R. E. Arthur. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 27-30.

Nicol prism, the propagation of light in a crystal.

12-6. **Distortion of Radiographic Image.** Robert Taylor. *Automotive & Aviation Industries,* v. 90, no. 2, Jan. 15, '44, pp. 34-35.

Conditions set forth to produce sharp true shadow of a defect. Forms of distortion discussed. 3 ref.

12-7. **Screw Threads.** S. M. Arnold. *Automobile Engineer,* v. 33, no. 444, Dec. '43, pp. 541-546.
A review of the literature dealing with fatigue effects.

12-8. **The Weakening Effect of Strengthening Ribs.** A. Fisher. *Magnesium Review,* v. III, no. 4, July '43, pp. 93-97.
Stress concentration. Criterion for strength of casting.

12-9. **Maintaining Quality Control of Machined Parts.** Louis C. Young and A. L. Atherton. *Machinery,* v. 50, no. 5, Jan. '44, pp. 167-172.
How a system of statistical quality control is being used in connection with the inspection of machined parts at the Westinghouse East Springfield, Mass., plant.

12-10. **Screening Materials for Use in Industrial Radiography.** G. H. S. Price. *Metal Industry,* v. 63, no. 22, Nov. 26, '43, pp. 338-339.
Description of screening materials, particularly heavy alloys, for use in industrial radiography. 6 ref.

12-11. **Estimating Radiographic Exposures for Multi-Thickness Specimens.** H. E. Seeman and George M. Corney. *Industrial Radiography,* v. 11, no. 2, Fall '43, pp. 33-38.
Exposure chart, curve of X-ray film exposure determination. 10 ref.

12-12. **Improved Stereoscopic Radiography.** Benjamin B. Burbank. *Industrial Radiography,* v. 11, no. 2, Fall '43, pp. 20-23, 31-32.
Basic principles of a method for accurate, three-dimensional location of depth of defects by using a reference marker, a fixed grid and two films separately exposed.

12-13. **Testing with X-Ray Counting Tubes.** *Industrial Radiography,* v. 11, no. 2, Fall '43, pp. 39-41.
An outline of recent German developments in quantitative intensity measurements by Geiger-Mueller counting tubes for use in detecting corrosion, blow holes and inclusions. (Reprinted from *Iron Age,* June 10, 1943.)

12-14. **Radiographic Density Measurement.** D. M. McCutcheon and Jonathan Parsons. *Industrial Radiography,* v. 11, no. 2, Fall '43, pp. 13-14.
Method of density determination to measure densities less than 2.5.

12-15. **Recent Developments in X-Ray Inspection.** Kent R. Van Horn. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 78-82.
Survey of X-ray equipment, accessories, and applications of radiography.

12-16. **Microradiography of Alloys.** Robert C. Woods and V. C. Cetrone. *Metals and Alloys,* v. 18, no. 6, Dec. '43, pp. 1320-1325.
Uses for determining internal structure; technique; advantages of the single (W-target) X-ray tube. 6 ref.

12-17. **Early Detection of Fatigue Cracks.** G. B. Kiner. *Metal Progress,* v. 45, no. 1, Jan. '44, p. 89.

Use of soap solution to detect minute cracks.

12-18. **A Method of Predicting Life of Tractor Bearings.** John Borland. *S.A.E. Journal (Transactions),* v. 52, no. 1, Jan. '44, pp. 19-27.

Rating bearings on a fatigue basis is, according to tests carried out by Mr. Borland, a reasonably accurate way of predicting bearing life when loading conditions are definitely established.

12-19. **Correlation of the Strength and Structure of Spot Welds in Aluminum Alloys.** F. Keller and D. W. Smith. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 23s-26s.

Radiographic method of testing strength of spot welds. 3 ref.

12-20. **Fatigue Strength of Welded Aircraft Joints.** T. V. Buckwalter and O. J. Horger. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 50s-58s.

Methods and results of fatigue tests on welded steel aircraft tubing. 4 ref.

12-21. **Fatigue Studies of Weld Test Triangular Structures with NE8630 Steel Tubing.** A. J. Williamson. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 27s-32s, 49s.

Sufficient points in fatigue testing were established and indicated little difference in the fatigue value for as-welded, tempered after welding, and normalized after welding test triangles. Some correlation between welding defects such as blisters, burning through, craters, etc. Failure could not be attributed directly to the high hardness in the heat-affected zone.

12-22. **Modern Hardness Testing Machines.** Kurt Meyer. *Engineers' Digest,* v. 1, no. 2, Jan. '44, pp. 102-104.

Rockwell "Testor," "Welltest," "Orthotest," the Super-Rockwell surface hardness machine. Briro UVK hardness tester described. Also instruments for internal Rockwell hardness measurements.

12-23. **Cracks in Wheel Seats Within the Hubs of Wheels.** G. W. C. Hirst. *Engineering,* v. 156, no. 4067, Dec. 24, '43, pp. 501-502.

Mathematical examination of the development of fatigue cracks in axles or shafts to which a wheel or other component is fixed by pressing or shrink fitting.

12-24. **The Technique of Microradiography.** S. E. Maddigan. *Journal of Applied Physics,* v. 15, no. 1, Jan. '44, pp. 43-54.

Investigations have been made of the various factors considered to influence the sensitivity of the microradiographic method for the examination of alloys. Both target element and applied voltage influenced the results. Radiographs are shown to demonstrate the effect; an explanation is given in terms of the X-ray emission curves and the absorption differential curves for the phases of the radiographed alloy. 7 ref.

12-25. **An Engineering Approach to the Selection, Evaluation and Specification of Metallic Materials.** H. W. Gillett. *Steel,* v. 114, no. 5, Jan. 31, '44, pp. 83-88, 102-110.

Testing of parts under simulated service conditions

and machinability as a processing requirement in selecting materials. Chemical composition alone is not a sufficient criterion in evaluating materials.

12-26. **Special-Purpose X-Ray Equipment.** *Aircraft Production,* v. 6, no. 63, Jan. '44, pp. 42-43.

Quantity-production inspection of aircraft bearings and light alloy castings.

12-27. **Alteration of X-Ray Beams to Meet Inspection Requirements.** Robert Taylor. *Aero Digest,* v. 44, no. 2, Jan. 15, '44, pp. 114, 116, 206, 209.

The use of filters to alter the quantity of a beam of X-rays is an empirical practice. The means by which the X-ray beam may be altered to meet individual requirements for inspection is discussed.

12-28. **The Possibility of Exploiting Magnetic Phenomena in the Testing of Steel.** Tadeusz W. Wlodek. *Canadian Mining & Metallurgical Bulletin,* no. 381, Jan. '44, pp. 5-15 (Trans).

That a test piece of ferro-magnetic steel is magnetic after it has been broken in tension indicates that, while it is being loaded, the steel acquires magnetic properties. In the present investigation of the influence of the stress on the magnetic flux, repeated pulsating stresses of increasing amplitude, varying from zero to the maximum tensile value, i.e., pull-pull loading, were employed. The specimens were prepared from two types of carbon steel and two of alloy steel. The magnitude of the magnetic flux was determined indirectly.

12-29. **Effect of Strain Rate Upon Plastic Flow of Steel.** C. Zener and J. H. Holomon. *Journal of Applied Physics,* v. 15, no. 1, Jan. '44, pp. 22-32.

An experiment has been designed to check a previously proposed equivalence of the effects of changes in strain rate and in temperature upon the stress-strain relation in metals. It is found that this equivalence is valid for the typical steels investigated. The behavior of these steels at very high rates of deformation may, therefore, be obtained by tests at moderate rates of deformation performed at low temperatures. The results of such tests are described. 13 ref.

12-30. **Practical Application of Quality Control.** W. A. Bennett and J. W. Rodgers. *Machinery* (London), v. 63, no. 1628, Dec. 23, '43, pp. 701-706.

Production has been materially assisted in a factory making small metal components to close engineering tolerances on single and multi-spindle automatic machines by the introduction of quality control.

12-31. **Studies in Three-Dimensional Photo-Elasticity Stress Concentrations in Shafts With Transverse Circular Holes in Tension. Relation Between Two- and Three-Dimensional Factors.** Max M. Frocht. *Journal of Applied Physics,* v. 15, no. 1, Jan. '44, pp. 72-78.

Part I. General problems of technique arising in three-dimensional photo-elastic analysis by means of the frozen stress pattern method are discussed. These include suggestions for loading, slicing, improvements of boundary visibility, a discussion of time stresses, and

methods for the determination of the fringe order and fringe value in a model with a static or frozen stress pattern. Part II. Stress concentration factors for shafts. 7 ref.

12-32. **To Distinguish Stainless From Inconel.** *Metal Progress,* v. 45, no. 2, p. 297.
Simple method using oxy-acetylene torch.

12-33. **Improving X-ray Radiographs by Filtering Out Secondary Radiation.** Robert Taylor. *Metal Progress,* v. 45, no. 2, Feb. '44, pp. 270-273.
Determination of secondary radiation and a method to minimize its detrimental effects. Clarity and contrast of film achieved.

12-34. **Consumer Control of Quality by Inspection.** *Metal Progress,* v. 45, no. 2, Feb. '44, pp. 282-284.
A series of talks held at the national convention of A.S.M. in Chicago. "Considerations having most to do with the Inspector" by Arthur W. F. Green. "Personal Equation in Inspection" by John W. W. Sullivan. "Acceptance Control—Not How Much Inspection, But How Good" by L. E. Ekholm. "Considerations Having to do With the Method of Inspection," by John A. Harrington. "Control Charts," by C. S. Gotwals. "A Specific Application of Quality Control" by H. R. Bellinson.

12-35. **An Engineering Approach to the Selection, Evaluation and Specifications of Metallic Material.** H. W. Gillett. *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 144-152, 171-175.
Suggests abandonment of traditional specification methods and selection of material by engineering judgment based on test data. Process often given "black eye" unnecessarily. Processing by alternate methods; low transverse ductility common; casting offers real advantages; specifications; buyers' intentions beclouded; "virgin metal" proviso stupid; unasked questions held clues.

12-36. **Analysis Shows How to Control and Prevent Locked-Up Stresses.** John Tutin. *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 136-138, 170.
Definition and principles.

12-37. **Determining Endurance Limits of Flexurally-Stressed Steel Members.** Frederick Frantz. *Product Engineering,* v. 15, no. 2, Feb. '44, pp. 97-98.
A method of evaluating the safety of flexurally stressed, heat treated steel members against the type of failure which originates below the surface from repeated stresses in excess of the endurance limit.

12-38. **Magnetic Powder Inspection of Highly Stressed Welds, Castings and Forgings.** J. A. J. Long., *Welding Journal,* v. 23, Feb. '44, pp. 123-124.
Methods for using magnetic powder inspection inexpensive.

12-39. **Inspection Efficiency.** *Machinery (London),* v. 64, Jan. 13, '44, pp. 42-43.
Steps taken to improve inspection efficiency by a firm engaged in the mass-production of small metal components made on automatic machines, capstan lathes, presses and special-purpose machines.

12-40. **Predicting Tractor Bearing Life.** John Borland. *Automotive & Aviation Industries,* v. 90, no. 3, Feb. 1, '44, pp. 36-37, 52, 54.

Procedure for determination of bearing life subjected to constant load at constant speed.

12-41. **Microradiography — A new Metallurgical Tool.** S. E. Maddigan and B. R. Zimmerman. *Metals Technology,* v. 11, no. 2, Feb. '44, Tech. Pub. 1683, 26 pages.

Outline of experimental procedure and discussion of results on tin, iron, lead, tellurium in copper alloys; identification of unknown constituents. 5 ref.

12-42. **How Brittle Lacquer Strain Analysis Aids Design.** M. Hetenyi and W. E. Young. *Machine Design,* v. 16, no. 2, Feb. '44, pp. 147-151, 268.

Stress concentrations at the surface of machine parts are responsible for most structural failures, hence the measurement of surface strain in loaded parts furnishes valuable clues to the weak spots. Use of brittle coatings for this purpose is discussed and some noteworthy applications of the method in design are described and illustrated.

12-43. **Wire Tests and Specifications.** Geoffrey K. Rylands. *Wire & Wire Products,* v. 19, no. 2, Feb. '44, pp. 109-113, 126, 128-129.

Elongation of fracture, torsion test, wrapping, and snarling test.

12-44. **Requirements to Be Met to Obtain Light Drive Fits.** Charles C. Colvin. *Automotive and Aviation Industries,* v. 90, Feb. 1, '44, pp. 24-25, 90.

Steel and duralumin bolt testing.

12-45. **Tightening Is Vital Factor in Bolt Endurance.** J. O. Almen. *Machine Design,* v. 16, no. 2, Feb. '44, pp. 158-162.

Endurance increases as stress range decreases; stress fluctuations unavoidable; effect of elasticity; springs can help or hinder; practical elastic considerations; yield point may be exceeded; bending loads; and utilizing spring members.

12-46. **Latest Findings on Surface Fatigue.** Earle Buckingham. *Machine Design,* v. 16, no. 2, Feb. '44, pp. 166-170, 248-250.

Surface fatigue is a phenomenon largely responsible for the type of wear commonly known as pitting. Definite information will permit the more intelligent and effective choice of materials for specific service conditions. Plastic flow work-hardens surface; influence of elastic deformation; destructive pitting; tests on cast iron alloys.

12-47. **A Method for Testing Cutting Oils.** H. L. Moir, J. S. Yule, D. J. Wangelin, and R. J. Moyer. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 6 pp. (mimeo).

Tool life tests can be used to determine value of the cutting oil for roughing cuts; finish life is not proportional to tool life for different cutting oils; finish life is the criterion for tool regrinding on finishing operations; oil produces smoother chip flow than dry cutting.

12-48. **On the Strength of Highly Stressed, Dynamically Loaded Bolts and Studs.** J. O. Almen. Preprint. War Engineering Annual Meeing, S.A.E., Detroit, Jan. '44, 11 pp. (mimeo).

Strength of dynamically loaded, highly stressed bolts and studs is determined by the man with the wrench; elasticity of bolts and studs should be as great as possible; bolted members should be as rigid as possible; their loss of dimension is hazardous to strength of short bolts and studs.

12-49. **Quality Control of Engineering Materials.** R. H. McCarroll and J. L. McCloud. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 8 pp. (mimeo).

Outline of the methods of quality control of materials during manufacture and processing used by Ford Motor Co. and illustrated by different types of production and fabrication.

12-50. **Getting a Better Grip on Quality Control.** John Gaillard. Preprint, War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 8 pp. (mimeo).

Control chart methods.

12-51. **Selective Inspection of Bearings.** *Tool & Die Journal*, v. 9, Feb. '44, p. 110.

Description of a method developed for inspection of bearings, which has given the most accurate and satisfactory results.

12-52. **Damping Capacity at Low Stresses in Light Alloys and Carbon Steel, with Some Examples of Non-Destructive Testing.** Leopold Frommer and A. Murray. *Institute of Metals Journal*, v. 11, Jan. '44, pp. 1-50.

This work was undertaken to establish (1) a reliable and accurate method for measuring the damping capacity of materials, particularly metals; (2) the significance of the damping capacity as a physical property of the material in terms of other known characteristics; (3) the influence exerted by structural defects, such as cracks and porosity, upon the measured damping and thus to afford means for non-destructive testing; and (4) the practicability of employing damping measurements as a means of quality control and inspection of raw material and finished components.

12-53. **The Riding and Wearing of Railway Carriage Tyres.** C. W. Newberry. *Engineering*, v. 157, Jan. 21, '44, pp. 57-60.

Examination and explanation of tyre profile records.

12-54. **A Concentricity Testing Fixture.** *Machinery (London)*, v. 64, Jan. 20, '44, p. 63.

Development of fixture for testing the concentricity of the finished outside cylindrical surface of a cone with its bore.

12-55. **Magnetic Methods for Testing Iron.** Rudolf Lessow. *Engineers' Digest*, v. 1, Feb. '44, pp. 172-173.

Magnetic methods which make use of electrical measurements may be used to draw conclusion regarding composition of tested material, previous treatment, dimensions.

12-56. **Creep of Metals.** Saul Dushman, L. W. Dunbar, and H. Huthsteiner. *Journal of Applied Physics,* v. 15, Feb. '44, pp. 108-124.

Experimental procedure, recording of elongation, theory, results on Al, Al-Mg, Pt, Ni-Mo, Ag. 16 ref.

12-57. **Selecting, Evaluating and Specifying Metallic Materials.** H. W. Gillett. *Foundry,* v. 72, March '44, pp. 106, 166-175.

Data relating to castings; certain properties of a material are of little value in determining its adequacy for a specific use, and discusses various determinations of the properties of metallic materials which are expressed in psi.

12-58. **Hardenability of 4150 Steel.** H. L. Walker, E. J. Eckel, J. Hino and F. H. Mueller. *Metals and Alloys,* v. 19, Feb. '44, pp. 346-350.

The hardenability at the center of SAE 4150 bar stock may be different from that at the surface. Shows that this anomalous center behavior is due to segregation and suggests heat-treating and testing practices to minimize its effects.

12-59. **Effective Time Control Setup for Stress Analysis Work.** Victor M. Kibardin. *Aero Digest,* v. 44, Feb. 15, '44, pp. 111-112, 215, 217-218.

Problems involved in stress analysis standardization; method to overcome these difficulties and application method discussed.

12-60. **Improved Method of Testing Steel Forgings at Chevrolet Forge.** P. D. Aird.. *Modern Industrial Press,* v. 6, Feb. '44, pp. 24, 26.

Improved method for handling tests of heat treated steel forgings in the manufacture of parts for Pratt & Whitney aircraft engines. The new method saves 279 lb. of critical steel per engine.

12-61. **Doubling Cassettes in Emergencies.** B. A. Kornhauser. *Metal Progress,* v. 45, March '44, pp. 509-510.

When radiographic department is near the upper limit of its X-ray equipment and thus requiring the use of intensifying screens, the scheme set forth will double the number of film cassettes available to handle the extra load.

12-62. **Early Detection of Fatigue Cracks.** Lawrence Ferguson. *Metal Progress,* v. 45, March '44, p. 512.

Detect the formation of fatigue cracks at an early stage by stretching them slightly (not over 5%) in a tensile testing machine.

12-63. **The Resin Method of Indicating Yield in Metals.** *Metal Progress,* v. 45, March '44, p. 512.

Resin coatings for indication of locations where metal is in distress are recommended for complicated stress systems in large structures at atmospheric temperatures.

12-64. **Notch Bend Test for Thin Stock.** S. L. Hoyt. *Metal Progress,* v. 45, March '44, p. 512.

Test devised by Heyn useful to determine how a pipe may behave with a screw thread on the end or the flat stock when blanked and formed.

12-65. **The Mottling of Aluminum Alloy Radiographs.** W. H. Glaisher, W. Betteridge, and R. Eborall. *Institute of Metals Journal,* v. 2, March 15, '44, pp. 81-89.

The mottled appearance frequently observed in radiographs of Al alloy castings has been investigated and shown to be a diffraction effect due to the irregular distribution of Laue spots from individual crystal grains, and the weakening of the transmitted beam when this diffraction occurs. No satisfactory method of obviating the defect, and thus making material faults more clearly visible, has been arrived at. 2 ref.

12-66. **A Simple Method of Control for Fine-Finished Surfaces.** J. Ferdinand Kayser. *Machinery* (London), v. 63, Dec. 30, '43, pp. 741-743.

A method of estimating surface finish by using a microscope to observe the interference fringes produced by monochromatic light.

12-67. **Allison Eliminates Faulty Castings by Use of Target Inspection Fixtures.** B. H. Yingling. *American Machinist,* v. 88, March 16, '44, pp. 125-135.

Shaped targets are used; each fixture first qualified; thirteen templets in one fixture; target indicates stock removal; square spindles for movable targets.

12-68. **Studies in Three-Dimensional Photoelasticity.** M. M. Frocht. *Journal of Applied Mechanics,* v. 11, March '44, pp. A-10-A-16.

Stresses in bent circular shafts with transverse holes —correlation with results from fatigue and strain measurements.

12-69. **Relations Between the Notched Beam Impact Test and the Static Tension Test.** C. W. MacGregor and J. C. Fisher. *Journal of Applied Mechanics,* v. 11, March '44, pp. A-28-A-34.

Results of static tension tests of both notched and uniform bars are compared with notched beam impact tests through the use of true stress-strain values. For the materials tested and under the temperature conditions imposed, it was found that the effect of drawing and testing temperatures on the energy absorbed per unit of volume was essentially the same for both static tension and notched beam impact tests. 19 ref.

12-70. **Method for Estimating the Shear Modulus of Elasticity.** L. E. Welch. *Product Engineering,* v. 15, March '44, pp. 215-216.

Mathematical development of equation.

12-71. **Primary-Exposure X-Ray Method for Reproducing Templates.** Thomas Miles. *Product Engineering,* v. 15, March '44, pp. 190-193.

Advantages and limitations of the primary-exposure method of template reproduction, one of the two X-ray methods now in use, are discussed. Procedures for preparing lay-outs and metal negatives are given in full, as well as details of the reproduction process.

12-72. **Some Principles of the Shewhart Methods of Quality Control.** W. Edwards Deming. *Mechanical Engineering,* v. 66, March '44, pp. 173-177.

The statistical method in a quality-control program can be made a potent factor in meeting the demands,

because it has the effect of: Increasing the safety and performance of product; decreasing the amount of inspection required, yet attaining better quality assurance; decreasing the production of defective material by attaining greater uniformity at a safe distance from the tolerances; giving early warning on changed conditions of manufacture that may cause trouble; improving vendor-purchaser relations by providing better records; providing a rational basis for setting tolerances with regard to requirements in service, and economics of production.

12-73. **Quality Control in Manufacture of Small-Arms Ammunition.** Hugh M. Smallwood. *Mechanical Engineering*,v. 66, March 44, pp. 179-182.

The application of quality control to the process inspection of small-arms ammunition. Results obtained.

12-74. **The Spark Test for Ferrous Metals.** *Blast Furnace and Steel Plant*, v. 32, no. 3, March '44, pp. 352-355, 394.

Practical description of this method of identifying alloy steels.

12-75. **X-Rays Now Gage Propeller Blade Thickness.** H. P. Moyer. *Aviation*, v. 43, no. 3, March '44, pp. 147, 275-276, 279-280, 283-284, 287-288.

Method described affords close tolerances, replaces unsatisfactory sectioning and caliper methods. New thickness-check procedure is applicable in processing any ferrous products.

12-76. **Electronic Detection of Pinholes.** Harold J. Hague. *Steel*, v. 114, March 20, '44, pp. 108, 110.

Device is capable of locating holes 0.001 in diameter in steel strip traveling at 1000 ft. per min. All off-grade stock, such as heavy and light gage sheets and those with minute holes, is routed into separate piles. Strip from 6 to 62 inches wide may be inspected and assorted.

12-77. **Cooperative X-Ray Research.** *Steel*, v. 114, March 20, '44, p. 96.

Program uses "all-seeing" eye of million-volt unit to eliminate defective castings before machining and call attention to flaws preventable by changes in casting design or procedure.

12-78. **Small Arms Inspection.** M. L. DeGuire. *Army Ordnance*, v. 26, March/April, '44, pp. 293-298.

The task of insuring quality weapons and ammunition.

12-79. **Strain-Gauge Rosette Formulae.** J. C. King. *Aircraft Engineering*, v. 16, Feb. '44, pp. 32-37, 49.

Strain gauges used in the aircraft industry as a means of assessing the loads in aircraft structures, both in structural testing laboratories and in flight.

12-80. **Ordnance Production Gaging.** R. A. Bowman. *Instruments*, v. 17, March, '44, p. 136.

Accuracy of gage inspection.

12-81. **Electronic Sorting.** *Iron & Steel*, v. 17, March '44, pp. 297-298.

Non-destructive qualitative and quantitative metallurgical testing.

12-82. **X-Ray Inspection of Light Alloys.** Robert Taylor. *Light Metal Age*, v. 2, March '44, pp. 20-21.

The selection of exposure factors for X-ray inspection; touches on the value and limitations of the fluoroscope, and suggests application of radiography in tensile tests of aluminum sheeting. 3 ref.

12-83. **A Method of Measuring the Thickness of Helical Involute Gear Teeth.** Joseph Reimer. *Machinery* (London), v. 64, March 9, '44, pp. 266-268.

Checking the tooth thickness of spur gears by the method of measuring across a number of teeth.

12-84. **X-Ray Analysis of Light Metal Alloy Castings.** Robert Taylor. *Aero Digest*, v. 44, March 1, '44, pp. 133, 200.

Destructive tests on critical materials are not practical and a reliable, non-destructive method of inspection has long been needed. Radiographic inspection has been accepted and is specified by various government agencies and engineering committees.

12-85. **Selecting, Evaluating and Specifying Metallic Materials.** H. W. Gillett. *Foundry*, v. 72, April '44, pp. 131-132, 272, 274, 278, 280, 282, 284, 286, 288.

Finding how to insure quality and freedom from scatter in metals more important than how to make chemical and mechanical post-mortems after service failure. Causes of variations in quality. 11 ref.

12-86. **Magnetic Testing.** Wm. K. Kehoe. *General Electric Review*, v. 47, April '44, pp. 59-60.

To control quality of ferrous alloy parts.

12-87. **Test Plugs Cut from Welds.** R. V. Anderson. *Metal Progress*, v. 45, April '44, pp. 696-697.

Methods commonly used in taking test plugs: Burning a section of the weld out of the seam with an oxy-acetylene flame; trepanning the test plugs with a "hole-saw"; drilling a ¼-in. pilot hole with an ordinary electric or air drill. Replace the drill in the arbor with a piece of ¼-in. drill rod, projecting far enough to go deep into the pilot hole. The drill rod has a greater degree of strength, and being perfectly smooth around the circumference, guides the hole-saw more evenly and it is thus possible to take any number of test plugs with one drill and one hole-saw.

12-88. **Radiographic Inspection of Metals.** Robert Taylor. *Steel*, v. 114, April 3, '44, p. 122, 124, 166, 168, 170.

Ability to define swiftly and accurately the outline of casting cavities or inhomogeneous structure in rolled steel is invaluable aid to producers and fabricators. Selection of right film is extremely important.

12-89. **Radium Radiography in Industry.** Robert Taylor. *Steel*, v. 114, April 10, '44, pp. 108, 110, 112.

Steam boilers, marine equipment and hydraulic power installations come under close scrutiny by radium's gamma rays. Once positioned, inspection equipment requires little attention. Radium lasts "forever." 9 ref.

12-90. **The Notched-Bar Impact Test.** John H. Hollomon. *Metals Technology,* v. 11, April '44, Tech. Pub. 1667, 25 pp.

An interpretation of notched-bar impact test that appears to be in agreement with the available published data. The interpretation discussed in this paper of the brittle failure of some steels in notched-bar impact test is similar to the qualitative analysis presented by Ludwig in the 1920's.

12-91. **Fluoroscopy and Radiography Combined in New Unit.** Robert Taylor. *Iron Age,* v. 153, April 20, '44, pp. 76-78.

Companies manufacturing die castings, molded plastic parts and assemblies, foundries that cast large quantities of small parts, producers of aircraft and other manufacturers who require mass X-ray inspection will find the combination unit described an efficient answer to many inspection problems.

12-92. **A Quantitative Hot Workability Test for Metals.** Harry K. Ihrig. *Iron Age,* v. 153, April 20, '44, pp. 86-89, 170, 172.

An elevated temperature, high-speed torsion test described for testing the hot workability of steels. Small bars are twisted to failure at various temperatures. The number of revolutions made before failure is a measure of the ductility of the metal at that temperature. These test data correlate very well with mill results in hot piercing operations.

12-93. **Conditioning of Steel Castings to Standards of Quality.** Paul Ffield. American Foundrymen's Association Preprint No. 44-18, April '44, 29 pp.

Application of non-destructive tests; influence of non-destructive testing on the conditioning of castings; radiographic standards of acceptability; practicability and interpretations of magnetic powder standards; significance of cracks in high-pressure, high-temperature castings; magnetic powder inspection as a complement to radiography; flame excavation of defects; magnetic inspection of flame-gouged areas.

12-94. **Magnetic Powder Inspection of Large Castings.** John F. Cotton. American Foundrymen's Association Preprint No. 44-25, April '44, 23 pp.

Shows that a standardized technique must be established before standards of magnetic powder inspection can be prepared.

12-95. **Fluoroscopic Inspection of Light Metal Castings.** Robert Taylor. *Metals & Alloys,* v. 19, April '44, pp. 869-873.

Inspection of light metal castings for internal flaws is conventionally done by radiography (X-ray photography). Increasing interest, however, is being shown in visual examination (i.e. without a permanent photographic record) by X-rays, using a fluorescent screen. Called fluoroscopic inspection, this obviously rapid process is still technically inferior to radiography in "sensitivity," but has already demonstrated its usefulness for pre-selecting or sorting of castings to be radiographed. This article discusses the process, its

applications and its limitations, and describes available equipment for its industrial use.

12-96. **Exposure Graphs for Radium Radiography of Steel.** A. Morrison and E. M. Nodwell. *American Society for Testing Materials Bulletin,* No. 127, March '44, pp. 25-29.

Speed, contrast, latitude, use of the exposure graphs.

12-97. **Radium Radiography of Thin Steel Sections.** A Morrison and E. M. Nodwell. *American Society for Testing Materials Bulletin,* No. 127, March '44, pp. 29-30.

Use of radium for the radiography of steel and bronze has been limited to sections of 1 in. or more in thickness. Radium radiography has been sucessfully used on the welds in pressure vessels of wall thickness ½ to 1 in. where it was not possible to take them to an X-ray machine, or to bring an X-ray unit to them.

12-98. **Use of Film to Measure Exposure to Gamma Rays.** A. Morrison and E. M. Nodwell. *American Society for Testing Materials Bulletin,* No. 127, March '44, pp. 31-32.

As an aid in establishing and maintaining safe working conditions, a method of measuring the exposure received at any point, or by any person, over a period of time is needed. X-ray film can be used for this purpose provided that the limitations and the necessary precautions are understood.

12-99. **Continental Developments.** R. E. Blakley. *Machinery, (Lloyd),* v. 16, March '44, pp. 56-57.

Further methods of testing bearings, beam balance or "see-saw" test, pendulum test, noise test, recorder adapter unit for indicating instruments.

12-100. **Radiographic Inspection.** L. Mullins. *Welding,* v. 12, March '44, pp. 135-141.

Non-destructive examination of welds.

12-101. **Realism in Metallurgical Treatment.** A. C. Vivian. *Metallurgia,* v. 29, March '44, pp. 233-238.

Emphasizes the need for a new approach to the subject of metallurgy, so that engineers will have something fresh by which they can quickly gather how modern metallic materials come by their mechanical properties, and how these latter are modified again by all likely or possible conditions of preparation for use and of use itself.

12-102. **Damping Capacity at Low Stresses in Light Alloys and Carbon Steel, with Some Examples of Non-Destructive Testing.** L. Frommer and A. Murray. *Metallurgia,* v. 29, March '44, pp. 239-247.

Undertaken to establish a reliable and accurate method for measuring the damping capacity of materials, particularly metals; to establish the significance of the damping capacity as a physical property of the material in terms of other known characteristics; to determine what influence is exerted upon the measured damping by structural defects, such as cracks and porosity, and thus to afford means for non-destructive testing; and to determine the practicability of employing damping measurements as a means of quality control and inspection of raw material and finished components. 9 ref.

12-103. **Some Physical and Wear Characteristics of Porous-Chromium-Plated Rings.** Tracy C. Jarrett. Society of Automotive Engineers *Journal*, v. 52, May '44, pp. 222-224.

Data showing the effect of temperature upon the decrease in hardness of chromium plate. The time and temperature data on chromium plate indicate that the decrease in hardness occurs in a very short interval of time, particularly at temperature around 700° F. Actual field tests show that ring life is increased and barrel wear reduced when using porous-chromium-plated rings in the top groove of each piston.

12-104. **X-ray Process Engineering.** Robert Taylor. *Foundry*, v. 72, May '44, pp. 74, 141, 142.

Specifications, application, equipment, and procedure treated briefly. 7 ref.

12-105. **Selecting, Evaluating, and Specifying Metallic Materials.** H. W. Gillett. *Foundry*, v. 72, May '44, pp. 75, 184, 186, 188, 190, 192, 194, 196, 198, 200.

Properties of bearing metal, material for high temperature applications, and writing of specifications. 5 ref.

12-106. **The Value of Radiographic Inspection to the Small Foundry.** Robert Taylor. *American Foundryman*, v. 6, May '44, pp. 2-4.

The value of this non-destructive method of inspection is not limited to the detection of imperfect castings; rather, emphasis should be placed upon its worth as a means of improved foundry control for the production of sound castings. 3 ref.

12-107. **Quality Control.** H. Howell. *Aircraft Production*, v. 6, April '44, pp. 198-201.

Three common misapplications of the system.

12-108. **Photoelectric Dimension Gage.** A. Edelman. *Electronic Industries*, v. 3, May '44, pp. 96-99, 256, 258, 260, 162.

Production-line inspection unit makes eight measurements on 20-mm. shells, delivering one shell per second.

12-109. **Supersonic Inspection Methods.** Boley A. Andrews. *Electronics*, v. 17, May '44, pp. 122-124.

Cracks, differences in hardness, changes in dimensions and variations in the composition of many materials can be quickly detected by new techniques utilizing supersonic frequencies. Three different methods, all involving electronic circuits, are described.

12-110. **The Measurement of Residual Stresses in Metals by the X-ray Back-Reflection Method, with Special Reference to Industrial Components in Aluminum Alloys.** Leopold Frommer and E. H. Lloyd. Institute of Metals *Journal*, v. 11, March '44, pp. 91-124.

A method capable of non-destructive measurement of the surface distribution of residual stresses by the determination of crystal-lattice strains, applied to coarse-grained material such as aluminum alloy castings and forgings, a type of specimen not previously regarded as amenable to this treatment. The method

is developed so as to give, in addition, approximate figures for the distribution of stresses in depth.

12-111. **Identification of Brinell Balls.** *Metal Progress,* v. 45, May '44, p. 902.

Method of distinguishing tungsten carbide from steel balls.

12-112. **Identification of Negatives.** George L. Parrott. *Metal Progress,* v. 45, May '44, p. 903.

Small notches on rack of plate holder identify negatives.

12-113. **Statistical Methods of Quality Control.** Craig Stirewalt and Jean Bordeaux. *Iron Age,* v. 153, May 11, '44, pp. 56-60.

Examples of size variations occurring in simple screw machine products are charted to interpret the principles of the statistical method of controlling quality during manufacture. Interpretation of data plotted graphically.

12-114. **Hardenability From Cast Specimens.** E. S. Rowland. *Iron Age,* v. 153, May 11, '44, pp. 61-65.

Equipment used and technique employed at the Timken plant for casting Jominy end-quench specimens. Graphs showing typical results from cast and forged hardenability tests.

12-115. **Surface Fatigue of Plastic Materials.** Earle Buckingham. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 297-310.

Influence of elastic deformation, destructive pitting, tests on cast-iron alloys.

12-116. **Procedures for Testing Metallizing Bond.** H. Ingham and K. Wilson. *Welding Journal,* v. 23, May '44, pp. 411-415.

Two procedures for standardizing testing methods for the adherence strength of sprayed metals. One is a test for shear strength, the other for tensile strength. These control quality of surface preparation in production and in working out procedures on new metals and coatings.

12-117. **X-Ray Blade Inspection.** John L. Bach. *Aero Digest,* v. 45, May 1, '44 pp. 88, 90.

American propeller has developed a process for the production of one-piece blades from seamless steel tubing, which involves forming the tube with shaping dies and internal pressure. The only welding required is at the tips and a short distance along the trailing edge, where the stresses are at a minimum.

12-118. **Graphical Method Simplifies Strain-Rosette Analysis.** J. H. Meier. *Machine Design,* v. 16, May '44, pp. 95-96, 174, 176.

Method of determining corrections for transverse gage sensitivity. Simplicity of the procedure offers many advantages over other methods, obviating the need for complicated tests to determine gage constants. 11 ref.

12-119. **Some Aspects of Commercial Production of Alloy Steels to Hardenability Requirements.** W. G. Bis-

choff. American Iron and Steel Institute Advance Paper, May 25, '44, 9 pp.

Cast tests vs. forged test results; comparison between positions in heat; correlation between various laboratories; hardenability as calculated from chemistry compared to actual results obtained.

12-120. **Purchase of Steels on Performance Rather Than Analysis—Dependable Performance is the Prime Consideration.** Glen C. Riegel. *Metal Progress,* v. 45, June '44, pp. 1090-1092.

If so-called performance tests in advance of steel fabrication can be correlated to the enhancement of durability and dependability in service, it is proper to make such tests at the earliest possible stage in the conversion of steel to finished parts to avoid misuse or loss after fabrication has proceeded so far that scrap and remelting is the only recourse.

12-121. **Present and Proposed System of Specifications.** Ernest E. Thum. *Metal Progress,* v. 45, June '44, pp. 1093-1094.

Analysis is distinctly secondary to some physical test, surface condition, or dimensional tolerance. Performance tests complicated from purchasers' viewpoint, steel makers' standpoint, and engineers' standpoint. German specifications as an example.

12-122. **Equivalence of Hardened Steels When Tested in Tension and Impact.** Walter G. Patton. *Metal Progress,* v. 45, June '44, pp. 1094-1096.

When yield point of fully hardened steels is plotted against tensile strength the result is a straight line (or band) up to a strength of 200,000 psi. Composition has small if any influence on the yield point other than in its indirect effect through depth of hardening. From 100,000 to 200,000 psi. a range of $\pm$ 10% from a smooth average curve includes 90% of the ratios for reduction of area, and 80% of the ratios for elongation. Above 200,000 psi. results are very erratic.

12-123. **Appraisal of Steels by Their Hardenability.** Walter E. Jominy. *Metal Progress,* v. 45, June '44, pp. 1097-1099.

End-quench test gives very little hint as to machinability, although it does give a pretty good idea about the ease of annealing, for the higher the hardenability, the more slowly the steel must be cooled to produce the desired low hardness for machining or cold working.

12-124. **Alloy Steel Specifications Based on Type Analysis and Hardenability.** Greswold Van Dyke. *Metal Progress,* v. 45, June '44, pp. 1099-1100.

More logical method of specifying alloy steels would be first to select a certain type of steel, and then—instead of specifying the exact chemical composition—simply require that the steel have a certain specified degree of hardenability, which is also a measure of strength.

12-125. **Problems Applying Especially to Toolsteels.** Sam C. Spalding. *Metal Progress,* v. 45, June '44, pp. 1100-1101.

Price, chemical composition and physical characteristics used as indexes in purchasing steels for tools.

12-126. **The Metallurgical Notch as a Factor in Fatigue Failure.** Walter H. Bruckner. *Metal Progress*, v. 45, June '44, pp. 1102-1103.

Uses the term "metallurgical notch" to denote narrow regions within a piece of metal, or near welded joints, where considerable changes in hardness occur. These act as stress raisers and have been responsible for numerous fatigue failures.

12-127. **Further Examples of the Damping Capacity of Metals.** W. H. Hatfield, L. Rotherham, and E. M. A. Harvey. *Metallurgia*, v. 29, April '44, pp. 295-298.

The main objects of the work described concern the investigation of points raised in connection with a previous paper.

12-128. **Radiography Applied to Welding.** Leslie W. Ball. *Iron Age*, v. 153, May 25, '44, pp. 54-58.

Information on the quality of welds can be obtained only by proper choice of a number of technical factors which apply in radiography. Emphasizes the need for reciprocal understanding between the welding engineer and the radiographer of X-ray problems so that standards of acceptability can be set up.

12-129. **Statistical Control in the Inspection of Materials.** Margaret Phipp. *Aircraft Engineering*, v. 16, April '44, p. 119.

Inspection of special steels, and the method of recording.

12-130. **Radiographic Inspection.** L. Mullins. *Welding*, v. 12, April '44, pp. 179-185.

Non-destructive examination of welds. 22 ref.

12-131. **Report of Committee A-6 on Magnetic Properties.** American Society for Testing Materials, Preprint No. 10, June '44, 17 pp.

Report on round-robin core loss testing at high flux densities; proposed tentative definitions of terms, with symbols, relating to magnetic testing.

12-132. **Micro-Deformation under Tension and Compression Loads of Thin Aluminum Alloy Sheets for Aircraft Construction.** Georges Welter. American Society for Testing Materials Preprint No. 31, June '44, 17 pp.

Test results on the stress characteristics for micro-elastic and micro-plastic deformations as well as the modulus of elasticity of thin aluminum alloy sheets in tension and compression. The sheets were analyzed for seven different angles to the direction of rolling and cold stretching as well as over the whole width. Investigation, consisting in submitting the specimens to tension stresses, succeeded by compression, showed results which are of interest to the designer and constructor of modern monocoque structures. A new gripping device for tension tests and a special device for compression tests on single thin specimens have been developed. 5 ref.

12-133. **Preliminary Studies on a Drop Ball Impact Machine.** George Lubin and Roswell R. Winans. American

Society for Testing Materials *Bulletin,* No. 128, May '44, pp. 13-18.

The drop ball impact test method is more applicable and more accurate than the Izod excess swing pendulum for impact strength determinations. Most of the errors inherent in the Izod machine are eliminated or reduced to a minimum using the drop ball method. The impact fatigue strength of plastics as determined by the latter method is a reliable indication of the actual working stress of the material. 5 ref.

12-134. **Metallography in Color.** R. P. Loveland. American Society for Testing Materials *Bulletin,* No. 128, May '44, pp. 19-29.

Problems of color photography discussed from the standpoint of (1) separation negative method, (2) screen plate process and (3) integral tripack process. Applications to photomicrography. 17 ref.

12-135. **Hardness Measurement for Rapidly Determining Carbon Content in Cast Steels.** K. L. Clark and Nicholas Kowall. *American Foundryman,* v. 6, June '44, pp. 13-14.

A method of hardness measurement for the rapid determination of the carbon content of carbon and low alloy steels.

12-136. **Photo-Elasticity.** *Automobile Engineer,* v. 34, April '44, p. 146.

An optical method of experimental stress analysis.

12-137. **X-Raying of Magnesium Parts.** Robert Taylor. *Aero Digest,* v. 45, May 15, '44, pp. 116-117, 220.

Various researches have shown that the most suitable contrast for X-ray inspection is found in the region of densities extending from 2.0 to 2.5. To obtain a closer approximation, the present study was undertaken. This study indicated that, at a density of 2.45, a film contrast sufficient to reveal a sensitivity of 1% in the radiography of magnesium alloy castings can be obtained with the proper type of film.

12-138. **Sheet Fractures Detected with Supersonics.** *Iron Age,* v. 153, June 8, '44, pp. 60-61.

German supersonic equipment has been developed to non-destructively locate intercrystalline fractures parallel to the surface of steel sheets. A continuous water contact is maintained between the steel sheet and the oscillator. 4 ref.

12-139. **Improved Methods for Determining the Compression Properties of Sheet Metal.** K. R. Jackman. *Automotive Industries,* v. 90, June 1, '44, pp. 36-38, 82.

Survey indicated that there was no method of obtaining the compressive properties of thin sheet-metal coupons rapidly and accurately. Consolidated Vultee developed a simple test procedure and the necessary test equipment for quickly and accurately determining the compressive properties of thin sheet-metal coupons.

12-140. **Magnetic Particle Inspection.** C. E. Betz. *Canadian Metals & Metallurgical Industries,* v. 7, May '44, pp. 30-34, 44-45.

Magnaflux method of inspection and an appraisal of methods and applications.

12-141. **"Black" Light.** G. W. Birdsall. *Steel,* v. 114, June 12, '44, pp. 94-97, 156, 158-159.

New and highly sensitive inspection tool provides positive indication of defects that otherwise would show up only as service failures. By preventing these failures, reliability of such critical items as aircraft engine bearings is greatly improved.

12-142. **Testing of Metals and Alloys.** J. W. Donaldson. *Metal Treatment,* v. 11, Spring '44, pp. 45-51, 54.

Summary of American work on methods of testing. Efforts made to obtain a closer correlation between different tests. Methods of micro-testing are also referred to. 26 ref.

12-143. **Applications of Industrial Radiography.** *Metal Treatment,* v. 11, Spring '44, pp. 59-61.

Non-technical statement showing some of the applications for which the method is particularly suitable.

12-144. **Progress in Bearing Metal Research.** P. G. Forrester. *Tin & Its Uses,* No. 15, March '44, pp. 5, 8.

Examination of the fatigue strength of various alloys.

12-145. **Calibration of X-Ray Stress Measurement Technique.** B. A. Erzoz. Thesis for M.Sc. Degree, Massachusetts Institute of Technology, 1944.

12-146. **Quantitative Measurements of X-Ray Energy.** Robert Taylor. *Aero Digest,* v. 45, June 1, '44, pp. 110,112.

Direct measurements customary, ions proportional to radiation, ionization chamber described.

12-147. **Measurement of Dynamic Stress and Strain in Tensile Test Specimens.** R. O. Fehr, E. R. Parker, and D. J. DeMicheal. *Journal of Applied Mechanics,* v. 11, June '44, pp. A-65-A-71.

The tensile strength, the yield strength, and the breakage energy of test specimens (cold-rolled steel and dural) were measured while the specimens were being broken by a force applied at a high rate of speed in a commercial high-velocity impact-testing machine. The dynamic tensile strength, the dynamic yield strength and the dynamic breakage energy were found to be higher than the static values up to the maximum impact velocities of these tests. 7 ref.

12-148. **Measurement of the Damping of Engineering Materials During Flexural Vibration at Elevated Temperatures.** Carl Schabtach and R. O. Fehr. *Journal of Applied Mechanics,* v. 11, June '44, pp. A-86, A-92.

A tuning-fork specimen is set into vibration by jerking a spreader from the gap between the ends of the tines. The damping is expressed in terms of the logarithmic decrement of the decaying vibration, which is measured and recorded by means of a magnetic oscillograph, amplifiers, and a resistance-type electric strain gage cemented to the specimen. The results include (1) the damping of a number of materials during flexural vibration and (2) the variation in modulus of elasticity with temperature.

12-149. **The Technical Cohesive Strength of Some Steels and Light Alloys at Low Temperatures.** D. J. McAdam.

R. W. Mebs, and G. W. Geil. American Society for Testing Materials, Preprint 27, June '44, 31 pp.

Tension tests of notched and unnotched specimens have been made at room temperature and at selected low temperatures down to that of liquid air. Diagrams have been constructed to show the influence of notch depth, notch angle, and root radius on strength and ductility. A study is thus made of the influence of the ratio of radial to axial stress on the technical cohesion limit and the influence of plastic deformation, heat treatment, and temperature on technical cohesive strength.

12-150. **X-Ray Unit Can Penetrate Steel Plate 8 in. Thick.** John L Bach. *Blast Furnace & Steel Plant,* v. 32, June '44, pp. 689-694.

The new and compact General Electric million-volt industrial X-ray unit is less than 5 ft. high and 3 ft. in diameter, and weighs about 1500 lb.

12-151. **Factors Affecting Hardness Relationships in the Range 50 to 250 Brinell.** Robert H. Heyer. American Society for Testing Materials, Preprint 95, June '44, 18 pp.

The effect of work-hardening capacity and the importance of close control of time of load application. A method based on observation of the contour of hardness indentations is described for constructing general hardness conversion tables of improved accuracy. Certain hardness-tensile strength relationships given in the literature are considered from the standpoint of the author's experimental data. A testing procedure is suggested for establishing both hardness and tensile conversion tables for specific materials.

12-152. **A Metallographic Quality Test for Malleable Iron.** H. W. Lownie and C. T. Eakin. *Steel,* v. 114, June 26, '44, pp. 96, 98, 100.

Photomicrographic standards used to evaluate malleable iron in terms of amounts of primary graphite, primary cementite and pearlite present. Some possibilities of non-destructive micro sampling by means of a core drill described.

12-153. **Relationship of Brinell Hardness and Yield Stress, in Certain Cast Steels.** T. W. Ruffle. Institute of British Foundrymen Advance Copy 801, June 10, '44, 5 pp.

Yield point and ultimate stress of carbon manganese steel, heat-treated and tested as described can be estimated by the formulae:

$$\text{Y.P.} = \text{B.H.N.} \times 0.08 + 12.56$$

$$\text{U.S.} = \text{B.H.N.} \times 0.15 + 13.32$$

with an accuracy of $\pm$ 1 ton per sq. in. for the former and $\pm$ 1.5 tons per sq. in. for the latter.

12-154. **High-Fidelity Photomicrography.** J. Winning. *Iron & Steel,* v. 17, May '44, pp. 348-350.

High-power microscopy necessitates minute attention to every detail of the optical systems, both of the microscope itself and the illuminating apparatus. Some of the factors often overlooked are dealt with.

12-155. **Damping Capacity.** Leopold Frommer and A. Murray. *Iron & Steel,* v. 17, May '44, pp. 367-370.

Non-destructive testing method at low stresses for light.

12-156. **Stress Analysis.** *Automobile Engineer,* v. 34, May '44, pp. 179-181.
Experimental methods employed in America. Brittle lacquer coatings, grades of stress-coat, full crack patterns, quantitative analysis, extensometers, electric strain gages, measurement of dynamic stresses, applications of stress analysis.

12-157. **Determination of Wear by Surface Measurement.** Geo. Schlesinger. *Machinery* (London), v. 64, June 8, '44, pp. 626-630.
Object is to compare the surface roughness of the used with the unused liner, each being heat treated and machined in the same way; compare the roughness due to wear and different machining operations; to check the differently worn surface; to determine the significance of certain bright circumferential grooves in the surfaces; to determine the best surface of the used liners after 126 hr. under load.

12-158. **Improved Method of Printing from Radiograph Negatives.** S. H. Thorpe and D. W. Davison. *Engineers' Digest,* v. 1, June '44, pp. 398-400.
A compensating filter to mask the printing light, enables quite high contrast to be retained for showing up defect images while avoiding the need for reproducing a wide range of densities throughout the picture as a whole.

12-159. **The Metallographic Examination of Aluminum-Rich Alloys.** N. H. Mason, G. J. Metcalfe and B. W. Mott. Institute of Metals *Journal,* v. 70, May '44, pp. 197-213.
Procedure adopted at Royal Aircraft Establishment; Type of microscope, method of illumination of the specimen, and methods of mounting and polishing specimens of alloys of different types. Some microstructural characteristics of cast and wrought commercial alloys are described, with particular reference to defects that have risen during manufacture or that have developed in use. 15 ref.

12-160. **Low-Powered Radiography of Thin Steel Sections.** Robert Taylor. *Steel,* v. 115, July 10, '44, p. 110.
When inspection must be facilitated and when higher powered equipment is not available, suitable radiographs can be secured by utilizing lower powered units in exposures with calcium tungstate intensifying screens.

12-161. **Accurate Inspection of Magnesium Alloy Castings.** Robert Taylor. *Iron Age,* v. 154, July 13, '44, pp. 55-58.
Correlation of X-ray testing, metallographic inspection and subsequent operations that will eliminate peripheral defects.

12-162. **Non-Destructive Testing.** *Automobile Engineer,* v. 34, May '44, p. 181.
Magnetic induction methods for non-ferrous, semi-finished metal products.

12-163. **Inspection Without Gauges.** *Machinery* (London), v. 64, June 8, '44, pp. 631-632.

Rapid method of checking components.

12-164. **Radiographing Magnesium Alloy Test Bars.** Robert Taylor. *Iron Age,* v. 154, July 20, '44, pp. 74-75, 151.

Radiographic inspection affords a means of knowing before the physical test is applied that the bar represents sound material; enables establishing standards upon which to base results of failure.

12-165. **Increasing Production Efficiency with Tool Life Tests.** L. L. Thill and E. B. Fremon. *Tool Engineer,* v. 14, June '44, pp. 93-94.

Report on the results of a large-scale tool life test conducted on automatic screw machines in actual production. Under identical test conditions, wide variations in results occur. Accuracy of results depends upon the number of tool changes in a test. Data on the life expectancy of cutting tools may be useful in setting up production operations for greater efficiency and lower costs.

12-166. **Wrench Torque Nomogram for Aircraft Nuts.** R. R. Wiese. *Product Engineering,* v. 15, July '44, pp. 503-504.

Table gives ultimate tensile strength, ultimate strength in single shear, and maximum bearing values for aircraft AN steel bolts used to fasten two or more sheets in a tension joint or connection, in which the bolts are subjected to shearing loads at sections lying in the plane of the sheet junctures and also bearing loads on the bolt body in contact with the sheets.

12-167. **Radiography of Non-Uniform Sections.** Robert Taylor. *Metals & Alloys,* v. 19, June '44, pp. 1393-1395.

Details of a recently developed single-exposure technique using two suitably chosen films in one holder that is expected to save much operating time. 4 ref.

12-168. **High Speed X-ray on Conveyor Line at Fisher Body.** Lloyd Lenox. *Modern Industrial Press,* v. 6, June '44, pp. 17-18.

The perfection of high speed X-ray equipment, which fits right into the production line and "pictures" as many as 40 parts a minute, marks the biggest step yet toward practical, universal X-ray inspection.

12-169. **Applying Creep Data in Design.** Joseph Marin. *Machine Design,* v. 16, July '44, pp. 123-126, 182.

Factors influencing creep, the methods of interpretation of creep tests, and the design of members subjected to creep.

12-170. **Specifying Steel on Hardenability.** L. L. Ferrall. *Steel,* v. 115, July 17, '44, pp. 106-109, 150, 152, 154.

Steelmakers can work to controlled hardenability but must be allowed wider composition limits to permit adjustment of individual elements at time of melting.

12-171. **Specifying Steel by Performance.** Greswold Van Dyke. *Machinery,* v. 50, July '44, pp. 206-207.

How a new method for determining steel performance came to be adopted; principle of the Jominy test.

12-172. **Fatigue Tests of Parts Made Basis for Design.** H. O. Boyvey. *Product Engineering,* v. 15, July '44, pp. 444-448.

Fatigue testing methods were developed to provide design criteria when certain aircraft parts failed, even when designed to carry a static load 50% greater than the maximum expected load. "Fatigue limits" based on performance of representative parts, and arbitrary estimates of fatigue loads establish safe values for design.

12-173. **Magnetic Analysis.** K. Hoselitz. *Iron & Steel,* v. 17, May 18, '44, pp. 433-435.

Determining the Fe-Ni phase diagram and the effects of cold work.

12-174. **Defects in Light-Alloy Sheet and Strip.** Light *Metals,* v. 7, June '44, pp. 259-262.

Detailed analysis of surface defects, their causes, prevention and cure.

12-175. **Industrial Fluoroscopic Inspection.** Robert Taylor. *Steel,* v. 115, July 24, '44, pp. 80-81, 124-127.

Applications, equipment and shortcomings of visual inspection by fluoroscopy. Method not suitable at present for inspection of ferrous metals although high-powered machines may make it possible to inspect thin steel sections.

12-176. **How the Navy Specifies Steel.** E. G. Touceda. *Steel,* v. 115, July 24, '44, pp. 103-106, 127-133.

Acceptability of steel for specific application. Endurance ratio below expectations. Statistical analysis of test data as applied to the development and improvement of steel specifications. Further research and method of attack.

12-177. **Fatigue Tests on Arc-Welded 3% Nickel Steel.** F. W. Thorne, A. Hunter and A. J. Hipperson. *Welding Journal,* v. 23, July '44, pp. 357-360s.

Tests carried out to determine the fatigue limit of butt joints welded with various types of electrodes, the plates being subject to different forms of heat treatment after welding.

12-178. **Practical Application of Stress Strain Theory.** F. C. Hoffman. *Aircraft Engineering,* v. 16, May '44, pp. 143-146.

If the limits to which parts can be formed by the common methods are known and applied, a very large percentage of parts can be designed so that they may be formed readily and economically using as few operations as possible.

12-179. **Notch-Toughness Tests of Carbon-Molybdenum Pipe Materials.** W. F. Kinney, I. A. Rohrig and H. S. Walker. American Society of Mechanical Engineers *Transactions,* v. 66, July '44, pp. 421-431.

Chemical composition, steel melting practice, and heat treating procedure, and their effects upon physical properties and microstructure are important factors in appraising the probable behavior of a material in service. Specific problem studied was to determine the influence on the uniformity of test results and on the

magnitude of average notch-toughness values, both at room temperature and at 925° F., of three variables, namely (a) the type of specimen, (b) the heat of steel, and (c) the condition of steel.

12-180. **Damping Capacity.** Leopold Frommer and A. Murray. *Iron & Steel,* v. 17, June '44, pp. 494-497.

Non-destructive testing method at low stresses for light alloys and carbon steels.

12-181. **Shell Cases at Norris Stamping and Mfg. Co. Receive Rigid Inspections.** Gordon B. Ashmead. *Modern Industrial Press,* v. 6, July '44, pp. 16-18.

The bulk of inspection is accomplished right at the machine doing the operation. Each piece of work is assayed as each operation is completed.

12-182. **Jessop Steel Company Opens New Research and Metallurgical Laboratory.** *Steel Processing,* v. 30, July '44, pp. 440-443, 452, 460.

General plan of building; planning and supervision; experimental melting and casting; experimental heat treatment; sample preparation; metallography; special testing; quality control—routine testing and statistical analysis.

12-183. **Surface Roughness and Sliding Friction.** J. J. Bikerman. *Review of Modern Physics,* v. 16, Jan. '44, pp. 53-68.

Methods of measurement; methods involving a contact between solids; interface layers and their elimination; adhesion theory of friction; resistance to sliding and sliding friction; monomolecular layer of lubricant; thicker lubricating films; journal bearings. 126 ref.

12-184. **Quality Control Inspection.** James Colasanti. *Mines Magazine,* v. 34, July '44, pp. 335-337.

Maintaining quality through statistical quality control.

12-185. **A Photo-Micrographic Case History in Magnesium.** M. H. Horton. *Light Metal Age,* v. 2, July '44, pp. 14-16.

A pictorial history of one plant's experiences with magnesium alloy. The manner in which photomicrography has exposed the cause of certain troubles. Exposes other conditions for which no explanations have as yet been found.

12-186. **X-Ray Absorption Coefficients.** C. H. Shaw. *Industrial Radiography,* v. 2, Spring '44, pp. 13-18.

Fundamental phenomenon behind the detection of flaws by radiographic methods. X-ray intensity; variation of intensity; linear absorption coefficient; use of the equation; mass absorption coefficient.

12-187. **Visualization of Angle-View Radiographic Technique.** L. P. Chartrand. *Industrial Radiography,* v. 2, Spring '44, pp. 18-19.

Description of a method intended to simplify the problem of finding the best technique and to facilitate its reproduction.

12-188. **New Developments and Applications of Fluoroscopic Examination of Metals and Assemblies.** Mario

Iona. *Industrial Radiography,* v. 2, Spring '44, pp. 20-25, 28.

Handling of the specimen and general X-ray protection; the screen; human eye; X-ray protection at the screen. 6 ref.

12-189. **Radiography Aids Steel Casting Technique.** G. W. McLeary. *Industrial Radiography,* v. 2, Spring '44, pp. 29-32.

How radiography aided a foundry to obtain sound castings by exposing defects that were thought to be non-existent.

12-190. **Radiographic Specifications and Standards for Naval Materials.** Clyde L. Frear. *Industrial Radiography,* v. 2, Spring '44, pp. 33-36.

Requirements, process approval, radiographic standards.

12-191. **Industrial Fluoroscopy.** R. W. Mayer. *Industrial Radiography,* v. 2, Spring '44, pp. 37-39.

Uses, limitations, the personal factor.

12-192. **The A, B, C of Quality Control.** J. M. Juran. *Mechanical Engineering,* v. 66, August '44, pp. 529-535.

Specification, operation, and inspection.

12-193. **Rapid Hand Polishing of Micro Specimens.** Anton L. Schaeffler. *Metal Progress,* v. 46, August '44, pp. 285-287.

Technique for production control of hard alloys, utilizes emery papers, wax lap, and "Gamal on Gamal." The latter is an abrasive containing alumina in gamma crystallographic modification, and a cloth with especially fine, close pile.

12-194. **Applying Creep Data in Design.** Joseph Marin. II. *Machine Design,* v. 16, August '44, pp. 113-118.

Graphs giving the working stress value for particular values of the permissible creep are plotted.

12-195. **Automatic Recording of Data Speeds Structural Testing Work.** Albert Epstein. *Product Engineering,* v. 15, August '44, pp. 557-560.

Testing techniques developed by the structural research group of Republic Aviation Corp. that simplify the measurement of compression yield strength and compressive stress-strain properties of sheet or light extruded material and the determination of deflection in riveted and spot welded joints.

12-196. **Quality Control of Production and Laboratory Methods of Testing Oil Filters and Refills.** Walter J. Ewbank. *Diesel Progress,* v. 10, August, '44, pp. 69-72.

Major functions performed by the research laboratory.

12-197. **Trends in Modern Weld X-Ray Inspection.** Robert Taylor. *Industry & Welding,* v. 17, August '44, pp. 68, 70, 72, 99-102.

The principles of X-ray technique in inspection of varying sectional thicknesses of ferrous and non-ferrous fabrications.

12-198. **Inspection of Castings.** Richard V. Elms. *Purchasing,* v. 17, August '44, pp. 91-94, 266, 268.

Perfection is expensive, but rejections and substandard products are far more expensive in the long run.

12-199. **Spending and Saving the People's Money. VII. Inspections and Tests.** Mary E. O'Connor. *Purchasing,* v. 17, August '44, pp. 112-114, 276.

Only that which can be checked should be specified; no specification should be adopted that provides involved methods of testing for the acceptance or rejection of materials, unless there are facilities and funds available for making the tests.

12-200. **Selecting Steels on the Basis of Carbon Content.** A S. Jameson. *Steel,* v. 115, August 14, '44, pp. 94-98, 100.

Tensile test and microscopic data presented to show that in the selection of a steel for a particular application, the primary consideration is choice of proper carbon content. Data on effect of other alloying elements included.

12-201. **Metallurgical Laboratory Has Many New Features.** *Steel,* v. 115, August 14, '44, pp. 116-118, 174.

Microscope and dark rooms are pressure conditioned. Provision made for melting, forging and heat treating heats. Machine tools located in basement to afford freedom from vibration.

12-202. **The Occurrence, the Cause and the Elimination of Cracks in the Rail Base.** Reinhold Kuhnel. *Stahl und Eisen,* v. 64, no. 11, 12, March 16 and 23, '44, pp. 169-175, 187-194.

Statistical data covering the occurrences of cracks in rail bases. Static and dynamic bending tests of rail bases. Magnaflux determination of cracks and fissures in the new and used rails of Thomas- and Siemens-Martin steel. Crystal structure in occurrence of rail base cracks.

12-203. **Relationship of Brinell Hardness and Yield Stress in Certain Cast Steels.** T. W. Ruffle. *Foundry Trade Journal,* v. 73, July 20, '44, pp. 227-231.

Brinell hardness test and yield stress as an acceptance test for steel castings. 2 ref.

12-204. **Torque and Thrust Measurements on Small Aircraft Engine Test Stands.** J. Liston and C. E. Schaefer. *Instruments,* v. 17, August '44, pp. 477-478, 480, 482, 484, 486, 488, 490.

Equipment and testing at Purdue University.

12-205. **The Fatigue Strength of Welded Joints.** Jonathan Jones. *Electrical Engineering,* v. 63, August '44, pp. 288-290.

Metals may fail in service as a result of repeated cyclical variations of stress. A research project, sponsored by the Welding Research Council of Engineering Foundation, has been conducted to investigate the endurance limits of welded joints. A summary of the progress and future plans. 8 ref.

12-206. **Variables Affecting the Results of Notched-Bar Impact Tests on Steels.** Clarence E. Jackson, Myron A.

Pugacz and Frank S. McKenna. *Metals Technology,* v. 11, August '44, T. P. 1668, 17 pp.

Materials; test specimens; equipment for testing; tests and data. 12 ref.

12-207. **Gaging of Taper Pipe Threads.** Ralph J. Consler. *Aero Digest,* v. 46, August 1, '44, pp. 112, 114, 122.

Resume of the gaging procedure for tapered aircraft pipe threads.

12-208. **Importance of Film Processing in X-Ray Inspection.** Robert Taylor. *Aero Digest,* v. 46, August 1, '44, pp. 76-77, 122.

Defects; proposed equipment and system for proper development. 2 ref.

12-209. **Testing of Aircraft Generators.** H. E. Keneipp. *Aero Digest,* v. 46, August 1, '44, pp. 101-102, 104, 140.

Tests include raw material, parts, laboratory, life, mechanical, and flight tests; describes tests which have been made and the interpretations which have led to improvements in d-c aircraft generators.

12-210. **A Simple Vector Method for the Determination of Orientations of Cubic Single Crystals from Back Reflection X-Ray Photographs.** Beulah Field Decker. *Journal of Applied Physics,* v. 15, August '44, pp. 610-612.

Description of system and examples.

12-211. **Determination of Discontinuities in Sheet Metal by Means of Ultrasonics.** A. Trost. *Zeit. des Vereines Deut. Ingenieure,* v. 87, no. 23/24, June 12, '43, pp. 352-345. *Engineers' Digest,* v. 1, August '44, p. 493.

Wherever the waves encounter an air gap they will be reflected, and thus be prevented from penetrating the piece. These areas can be detected by probing the opposite surface of the sheet by means of an ultrasonic receiver. The sensitivity of fault detection depends upon the length of the ultra sound wave within the piece and upon the frequency.

12-212. **Fatigue Testing of Metals.** P. G. Soerensen. *Maskinteknik,* no. 22, March 25, '44, pp. 17-27. *Engineers' Digest,* v. 1, August '44, pp. 511-512.

Twenty-ton pulsator fatigue testing machine is an hydraulically operated unit permitting a maximum load variation of 20 tons within a range of 20 tons compression and 20 tons tensile loading. Its frequency can be adjusted at 750, 1000, 1500, or 2000 cycles per min. Working principle outlined.

12-213. **Internal Stresses of I-Beams.** R. V. Baud and M. Inan. *Schweizer Archiv,* v. 9, no. 9, Sept. '43, pp. 276-287. *Engineers' Digest,* v. 1, August '44, pp. 526-530.

Uneven cooling produces internal stresses, which could be calculated if the temperature as a function of time were known. Mathematical development of formula.

12-214. **Abstract of the True Stress-Strain Tension Test —Its Role in Modern Materials Testing.** C. W. Macgregor. *Franklin Institute Journal,* v. 238, August '44, pp. 111-135.

Application of the true stress-strain tension test in connection with metal forming processes, notched-

beam-impact tests, fatigue tests, notch-effect tests, and combined stress experiments.

12-215. **Pilot Rolling Mills.** R. L. Hartford. *Steel,* v. 115, August 28, '44, pp. 114, 116.

Aid in checking physical specifications in relation to chemical composition.

12-216. **Organic Coating Aids Magnetic Inspection.** Gilbert C. Close. *Iron Age,* v. 154, August 31, '44, p. 41.

Coating that is quicker to apply and cheaper than the cadmium flash coating process, to apply a bright background for magnetic inspection.

12-217. **A Numerical Rating Method for the Routine Metallographic Examination of Commercial Magnesium Alloys.** P. F. George. American Society for Testing Materials *Bulletin,* no. 129, August '44, pp. 35-44.

Method for routine examination of these alloys, so inexperienced persons could record a microstructure. Such a method described and includes the specimen preparation, etching technique, and a rating system for recording the microstructure as a series of numbers.

12-218. **Fluorescence as an Aid to Inspection.** J. Brennan. *Metallurgia,* v. 30, June '44, pp. 70-72.

Underlying phenomena of fluorescent materials in their application for inspection purposes.

12-219. **The Spectrograph as an Inspection Tool.** J. D. Graham and H. F. Kincaid. *Metals & Alloys,* v. 20, August '44, pp. 355-358.

Outlines the principles of spectroscopy, describes the layout and methods used at International Harvester Co., and shows how successfully the machine operates as a composition-control tool.

12-220. **Inspection by Projection.** *Aircraft Production,* v. 6, July '44, pp. 307-308.

Application of Hilger equipment for checking quantities of small components.

12-221. **Mechanized Inspection.** *Machinery* (London), v. 64, June 29, '44, pp. 701-706.

Under the conveyor system of inspection, the handling of parts from the time they are machined until they are stored finished, or ready for the next machining operation, is mechanized.

12-222. **Stopper Heads X-Rayed to Eliminate Pouring Trouble.** Clyde B. Jenni. *Foundry,* v. 72, Sept. '44, pp. 68-69, 208.

Internal defects of castings are disclosed by nondestructive testing, such as gamma-ray or X-ray examination; a similar study was proposed for the inspection of stopper heads. Short wave-length gamma rays were found to be less satisfactory for the examination of materials of densities of graphite-clay mixtures than the longer wave-length, low power X-rays.

12-223. **Applying Fluoroscopy to Industrial Inspection.** R. W. Mayer. *Foundry,* v. 72, Sept. '44, pp. 128, 136.

Limitations in use of fluoroscope for industrial inspection.

12-224. **Ingenuity Cuts Hub-Bub Out of Hub Making** *Wings,* v. 3, Sept. '44, pp. 1209-1211.

Special engraving and inspection methods that prove fast and easy to use, and release expensive equipment for other work.

12-225. **Effects of Notching on Strained Metals.** G. Sachs and J. Lubahn. *Welding Journal,* v. 23, August '44, pp. 364-s-368-s.

Correlates the experimental evidence relating to notch effects in tensile specimens. Stress distribution and some conceptions of cohesive strength. 16 ref.

12-226. **Mounting Small or Fragile Specimens.** Gordon Sproule. *Metal Progress,* v. 46, Sept. '44, p. 484.

Preparing cross sections and longitudinal sections of fine wire in a lucite mount; pieces are gripped by folds in a strip of sheet lead, and pinched tight with pliers.

12-227. **Identification of Specimen Mounts.** R. L. Duffner. *Metal Progress,* v. 46, Sept. '44, p. 487.

Uses a vibrating type of electric marking tool to cut or scratch the identification on plastics.

12-228. **A Comparison of Microhardness Indentation Tests.** Douglas R. Tate. American Society for Metals. 1944 Preprint No. 1, 10 pp.

Tukon and Eberbach testers have extended the range of hardness tests to small areas, thin surface layers and brittle materials. Indentation numbers obtained with these machines are not independent of load, a fact which makes advisable an examination of the reasons for this lack of uniformity. Comparison data for the two testers throughout their common range of loads are presented.

12-229. **Improved Sensitivity in Double Exposure Radiography.** James Rigbey. American Society for Metals. 1944 Preprint No. 2, 13 pp.

Return made to the stereoscopic method of exposing two separate films. In order that precise measurements can be made of the shift of a flaw image to determine the vertical position of the flaw, the image of a lead marker is used as a reference point. The measurement may then be corrected for the known shift of the marker image and used as in the case of double-exposure radiography. In experiments with cast aluminum and steel blocks up to 2 in. in thickness, it was found that the consequent increased possible error in measuring the image shift does not appreciably alter the accuracy with which the position of the flaw is determined. 5 ref.

12-230. **The Interpretation of Radiographs; Particularly of Aircraft Parts.** Leslie W. Ball. American Society for Metals. 1944 Preprint No. 3, 30 pp.

Basic policy and procedure for the interpretation of radiographs. The objectives of radiography in the aircraft industry are stated. A system of identifying radiographic images with metallurgical defects is presented and methods are suggested for assessing the acceptability of defective parts.

12-231. **Further Developments of the End Quench Hardenability Test.** Charles R. Wilks, Earnshaw Cook, and

Howard S. Avery. American Society for Metals. 1944 Preprint No. 6, 20 pp.

Hardenability test bar selectivity quenched from both ends has been developed to provide correlations with the thermal histories of quenched plates. For those steels where the pearlitic reaction may be avoided but which transform partially or wholly under the same cooling conditions to acicular structures of the bainite type, this test should be useful in predicting behavior at the section center, since the mechanical properties at the center of symmetrical double end quench specimens may be determined. 9 ref.

12-232. **A Hardenability Test for Low Carbon and Shallow Hardening Steels.** O. W. McMullan. American Society for Metals. 1944 Preprint No. 7. 19 pp.

Experiments and results obtained from jet quenching one face only of tapered or wedge shaped specimens and taking hardness readings along the other face of the wedge. By taking readings on a face oblique to the quenched face, rather than on one perdendicular to it as in the standard end-quench method, the hardened zones are greatly widened. This permits more readings and less error from inaccuracy of spacing. No cutting after hardening is necessary. Consistent results have been obtained on several types of steel. 4 ref.

12-233. **The Effect of Fiber on Notched Bar Tensile Strength Properties of a Heat Treated Low Alloy Steel.** George Sachs, J. D. Lubahn, L. J. Ebert and E. L. Aul. American Society for Metals. 1944 Preprint No. 14, 15 pp.

Regular and notched bar tensile tests on specimens taken in both the longitudinal and transverse directions from 1½ and 2¾-in. diameter, hot-rolled rod of a low alloy steel, S.A.E. 3140. Most of the specimens were heat treated to a strength level of 190,000 psi. The concentric notch ductility and the eccentric notch strength measured the ductility of the metal, as influenced by rod size and fiber direction, in nearly the same manner as shown in previous investigations. 4 ref.

12-234. **Fractography—a New Tool for Metallurgical Research.**. Carl A. Zapffe and Mason Clogg, Jr., American Society for Metals. 1944 Preprint No. 36, 28 pp.

Fractography is the technique of studying untouched cleavage facets at high magnification. It offers many of the advantages of single-crystal methods, since the field is oriented about the cleavage plane; reveals much of the internal structure of the grain; time saved by avoiding mounting, polishing, and etching; and tiny chips and otherwise unusuable fragments are suitable for fractographic examination.

12-235. **"Strength" in Technical Parlance.** A. C. Vivian. *Metallurgia,* v. 30, July '44, pp. 127-129.

The term "strength" is in general used so frequently for different purposes that its meaning has become somewhat confused; even descriptions by technicians are vague, yet in its application to metals it is important that there should be no ambiguity in its use concerning the property of the metal or alloy under considera-

tion. To overcome confusion the author presents a proposal for the use of the word in technology.

12-236. **Metallurgical Examination of Light Alloy Cylinder Heads from German Aircraft.** *Metallurgia,* v. 30, July '44, pp. 159-162.

Summary of data resulting from the metallurgical examination of parts from enemy aircraft carried out at the request of the Committee on Non-Ferrous Metal Parts of Enemy Aircraft. The parts examined were three cylinder heads taken from Bramo-Fafnir 323, B.M.W. 132, and B.M.W. 801 engines.

12-237. **Inspection Methods for Quality Control.** *Die Casting,* v. 2, Sept. '44, pp. 64, 66, 68.

Quality control assures uniform and consistently good results in the application of die castings. Equipment employed by the General Electric Co. in commercial checks and in research and development to improve die casting practice.

12-238. **Strengthening of Circular Holes in Plates Under Edge Loads.** Leon Beskin. *Journal of Applied Mechanics,* v. 11, Sept. '44, pp. A-140-A-148.

Stress distributions determined around strengthened circular holes in plates submitted to edge loads at infinity.

12-239. **Conditioning of Steel Castings to Standards of Quality.** Paul Ffield. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 173-204.

Evaluation of integrity; application of non-destructive tests; influence of non-destructive testing on the conditioning of castings; radiographic standards of acceptability; practicability of magnetic powder standards; standardization necessary for uniformity of test results; interpretation of the magnetic powder test; significance of cracks in high-pressure, high-temperature castings; magnetic powder inspection as a complement to radiography; value of magnetic powder method of inspection; responsibility for integrity; flame excavation of defects; magnetic inspection of flame gouged areas.

12-240. **Magnetic Powder Inspection of Large Castings.** John F. Cotton. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 205-231.

Variables involved in magnetic powder inspection. Standards should be established to govern the variables encountered in the application of this method of inspection. Evaluates the variables quantitatively. Shows that a standardized technique must be established before standards of magnetic powder inspection can be prepared.

12-241. **The Micro-Topography of Finely-Finished Reflecting Surfaces.** J. Ferdinand Kayser. *Machinery* (London) v. 65, July 27, '44, pp. 85-89.

A method for quantitatively determining the micro-topography of finely finished reflecting surfaces, surfaces on which the maximum depths of the scratches or surface imperfections are of the order of 1μ (40 micro-inches) or less.

12-242. **The Non-Destructive Testing of Metallic Components.** Bruce Chalmers. *Metal Treatment,* v. 11, Summer '44, pp. 117-123.

Methods in use for the non-destructive testing of metals. Deals, in turn, with the application of those methods in measuring dimensions, detecting flaws, estimating physical properties, and examining surfaces.

12-243. **Radiography of Light Alloy Castings.** C. T. Snushall. *Light Metals,* v. 7, August '44, pp. 375-382.

Applications of filters and intensifying screens.

12-244. **Standards for Surface Quality and Machine Finish Designation.** James A. Broadston. *Product Engineering,* v. 15, Sept. '44, pp. 622-625.

Possible effects of surface quality on strength and functioning of machine or structural members. Surface irregularities that define quality, methods of measuring roughness and standard roughness values are described.

12-245. **Spot Weld Inspection Methods.** D. J. Rahn. *Welding Engineer,* v. 29, Sept. '44, pp. 42-44.

Policies and personnel of "Inspection" contribute as much to the quality of the individual weld as the operator's ability or the perfection of his equipment.

12-246. **Failures in Cold-Headed Machine Bolts.** Herbert R. Isenburger. *Steel,* v. 115, Sept. 18, '44, pp. 116, 118.

Characteristic failure of defective bolts studied was a separation of the head from the shank under comparatively slight tension by transverse impact. The regular and almost polished character of the exposed metal surface suggested that the defect causing the failure was a rupture within the head. X-ray examination was used to determine whether ruptures were present before breakage, and whether these ruptures always occurred in a particular zone or might take place anywhere in the head.

12-247. **The Bi-Axial Fatigue Strength of Low Carbon Steels.** G. K. Morikawa and L. V. Griffis. American Welding Society Preprint, Oct. '44.

Basic information on the fatigue strength of metals, unwelded and welded, subjected to cyclic combined stresses; silicon-killed, SAE 1020 steel was investigated using thin-walled tubular specimens machined from solid bar stock.

12-248. **How Much Ductility Is Necessary for a Structure or Machine.** W. J. Conley. American Welding Society Preprint Oct. '44.

Explanation of the action of metal during elongation and differentiation between elongation as measured by the tensile test and the true value. Conditions which may change action of metals so that they are not able to show normal elongation or yield and means for avoiding this condition by correct design explained.

12-249. **X-Ray Control in the Magnesium Foundry.** Robert Taylor. *Light Metal Age,* v. 2, Sept. '44, pp. 30-31, 39.

Common faults to be found in the production of magnesium sand castings; shows the part X-ray can play in foundry control and offers a suggested design and arrangement for a small foundry X-ray unit.

12-250. **The Effect of Stray Radiations in X-ray Inspection of Light Metals.** Robert Taylor. *Western Metals,* v. 2, Sept. '44, pp. 25-26, 29-30.

The effect is to reduce the legibility of an image by producing an increased "foglike" density which is undesirable in the production of high quality radiographs. 4 ref.

12-251. **Industrial X-Ray Units.** *Steel,* v. 115, Sept. 25, '44, pp. 112, 114.

Speed ordnance production. Fast, automatic shell inspection lowers number of rejects at three U. S. plants.

12-252. **The Relationship Between Brinell and Vickers Hardnesses and Tensile Strength.** Heinrich Staudinger. *Stahl und Eisen,* v. 63, '43, pp. 537-539. *Alloy Metals Review,* v. 3, March '44, p. 2.

Comparisons were made with three carbon steels, containing 0.17 to 0.6% C, and with four alloy steels containing C 0.2 to 0.36, Mn 0.5 to 1.4, Cr 1.3 to 2.4, Mo 0 to 0.4, Ni 0 to 1.7 and V 0 to 0.3% in the annealed and heat treated conditions. Brinell hardnesses were measured with the 10, 5 and 2.5-mm. balls. Vickers measurements were made with a 50-kg. load. The tensile strength of the steels ranged from approximately 70,000 to 215,000 psi. Curves show variations ranging from 2 to 10% and averaging 4.5%.

12-253. **Tessellated Stresses—Part III.** F. Laszlo. Iron and Steel Institute Advance Copy, August '44. 25 pp.

Characteristic component system of tessellated stresses due to crystal anisotropy analyzed for metals with cubic, hexagonal or tetragonal lattices. Effect of tessellated stresses on thermal constants studied. Irreversibility and hysteresis may be involved. Question of modification, i. e., reduction, of tessellated stresses and their influence on density discussed.

12-254. **Torsion Strain.** *Automobile Engineer,* v. 34, July '44, p. 294.

Determination of the stress concentration factor of fillets on stepped shafts.

12-255. **Distribution of Shear Strength of Spot Welds in Various Aluminum Alloys.** Translated by R. F. Tylecote and Angela Lias from the German of F. Bollenrath and V. Hauk. *Welding Journal,* v. 23, Sept. '44, pp. 435-s-442-s.

Aluminum alloys investigated included those containing magnesium, copper and magnesium, and also magnesium and zinc. 19 ref.

12-256. **Coordination of Research and Testing Activities in the Aircraft Industry.** Maurice Nelles. *Welding Journal,* v. 23, Sept. '44, pp. 454-s-457-s.

Nature of the research activity.

12-257. **Behavior of Residual Stresses Under External Load and Their Effect on Strength of Welded Structures.** *Welding Journal,* v. 23, Sept. '44, pp. 473-s-480-s.

A basic experimental study of effect of residual stresses on the strength of the base metal in welded constructions subjected to static, repeated or vibration

loading. Effect of high welding current intensity on the strength of the base metal. Effect of premature plastic deformation produced during loading, on the safety of the welded structures.

12-258. **Relationship of Brinell Hardness and Yield Stress.** T. W. Ruffle. *Iron Age,* v. 154, Sept. 28, '44, pp. 50-53.

Data whereby the yield stress of certain cast steels may be accurately checked by a non-destructive test, such as the Brinell hardness test.

12-259. **Metallurgical Examination of Light Alloy Cylinder Heads from German Aircraft.** *Foundry Trade Journal,* v. 74, Sept. 7, '44, pp. 9-10, 14.

Chemical composition; macrostructure; microstructure; comments.

12-260. **Industrial Radiography.** V. E. Pullin. *Foundry Trade Journal,* v. 74, Sept. 7, '44, pp. 13-14.

Photographic technique; interpretation.

12-261. **The Significance of Tensile and Other Mechanical Test Properties of Metals.** Hugh O'Neill. Institution of Mechanical Engineers *Journal,* v. 151, Sept. '44, pp. 116-130.

Critical consideration of the conventional quantities obtained from the tensile test reveals their limitations for design purposes, especially where notch-fatigue effects predominate. Against such notch-fatigue the importance of high work-hardening capacity in a metal is emphasized, and its relation to tensile elongation behavior outlined. Even conventional tensile records may yield some rough measure of work-hardening capacity prior to cracking by means of quantities which have here been called "plasticity ratio" and plasticity value.

12-262. **Cartridge Brass; Special Properties and Physical Testing.** L. E. Gibbs. *Metal Progress,* v. 46, Oct. '44, pp. 699-704.

Notes and precautions are given on the testing of cartridge brass, discussing particularly the three current methods of determining "yield point." Creep strength is probably the best if not the only logical criterion for design of those copper-base alloys that have to carry steady loads.

12-263. **Endurance of NE Steels in 1¾-in. Specimens.** O. J. Horger and T. V. Buckwalter. *Metal Progress,* v. 46, Oct. '44, pp. 727-729.

Fatigue tests on notched and unnotched specimens of S. A. E. 4340, NE8744, NE8949, and NE9445.

12-264. **Dependability of Engineering Property Tests.** H. A. Reece. *Steel,* v. 115, Oct. 9, '44, pp. 130-132, 296, 298.

In testing metals for physical characteristics, it behooves the engineer to ascertain which tests are truly representative, sufficient in number and thoroughly reliable. Tests for single characteristic often more dependable.

12-265. **Specification on Performance.** *Steel,* v. 115, Oct. 9, '44, pp. 180-182, 185, 188.

Overwhelming majority of plants favor purchase of materials on basis of physical characteristics rather than chemical analysis. Hardenability band data already available for many National Emergency and alloy steels.

12-266. **X-Ray Inspection Detects Faulty Repair Job.** Herbert F. Scobie. *American Foundryman,* v. 6, Oct. '44, p. 21.

Describes an unsuccessful attempt to salvage a steel casting by welding.

12-267. **New Developments in Die Materials.** Richard Bredenbeck. *Iron Age,* v. 154, Oct. 12, '44, pp. 60-61, 66.

The correlation in chart form of the impact strengths of a great number of die materials has resulted in substitutions not previously made. The result has been dies of much longer life for certain operations, which show no pick-up and which run without touch-up for much longer periods.

12-268. **Selection of Automotive Steel on the Basis of Hardenability.** A. L. Boegehold. *SAE Journal,* v. 52, Oct. '44, pp. 472-485.

Principles of selecting steel on the basis of hardenability. Customary procedures as to hardness requirements in the as-hardened condition to ensure a desirable structure after tempering.

12-269. **Hardness Conversion Tables.** *Machine Design,* v. 16, Oct. '44, pp. 109-111.

Because numerous different hardness scales are in general use, it often is difficult to compare the relative hardness of metals which have been tested with different measuring devices. To aid the designer in making such comparisons, the conversion tables are presented in this data sheet, together with a brief discussion of indentation hardness tests.

12-270. **Fluorescent Penetrant Inspection.** Greer Ellis. *Steel,* v. 115, Oct. 16, '44, pp. 100-102, 164.

Methods for non-magnetic and non-destructive testing to determine minute surface faults have been greatly improved by recent developments, some of which are outlined here with details showing typical applications.

12-271. **X-Ray Inspection Reveals Stopper Head Defects.** Clyde B. Jenni. *Steel,* v. 115, Oct. 16, '44, p. 104.

Successful pouring of heats of steel is dependent on stopper rod assembly. Inspection of stopper heads with long wave-length, low power X-rays uncovers defects which may result in troublesome pouring. Short exposure is sufficient for satisfactory negative.

12-272. **Spotting Cobalt High Speed.** Victor F. J. Tlach. *Metal Progress,* v. 46, Oct. '44, p. 714.

Two schemes for distinguishing tungsten high speed toolsteel from the varieties containing cobalt.

12-273. **Bend Tests Above Room Temperature.** C. F. Sawyer. *Metal Progress,* v. 46, Oct. '44, p. 714.

By keeping the bend specimens at the proper temperatures until the test actually starts, having the fix-

ture warm, and making the test on a hot anvil, the temperature at the time of testing could be relied upon.

12-274. **Statistical Quality Control.** Vernon R. Grom and Martin A. Brumbaugh. *Aero Digest,* v. 46, Sept. 15, '44, pp. 110-112, 136, 138, 143.

Technique developed to reduce faults in assembly operations, to speed up production and to establish sampling inspection procedure which will assure the most economical control over the quality of incoming materials.

12-275. **Development of a Monochromatic Radiographic Method for Locating Small Defects in Aluminum Alloy Castings.** *Industrial Radiography,* v. 3, Summer '44, pp. 13-18.

The use of molybdenum radiation in the radiographic study of light metals and alloys has certain advantages over the use of tungsten radiation, even when the X-ray tube with tungsten target is operated at the relatively low voltages of 30 to 40 kilovolts. 18 ref.

12-276. **Radium Radiography of Thin Steel Sections.** A. Morrison and E. M. Nodwell. *Industrial Radiography,* v. 3, Summer '44, pp. 30-31.

Radium radiography has been successfully used on the welds in pressure vessels of wall thickness ½ to 1 in. where it was not possible to take them to an X-ray machine, or to bring an X-ray unit to them.

12-277. **Use of Film to Measure Exposure to Gamma Rays.** A. Morrison and E. M. Nodwell. *Industrial Radiography,* v. 3, Summer '44, pp. 31-32.

The essential basis of this method is the establishment of a relationship between the amount of radiation received by a film and the blackening of the film thus produced. This relationship can then be used to determine the amount of radiation received by persons carrying film, and if the amount of radiation in a tolerance dose is agreed upon, the safety, or otherwise, of working conditions will be known.

12-278. **A Renaissance of Mechanical Properties**. A. C. Vivian. Institution of Mechanical Engineers *Journal,* v. 151, Sept. '44, pp. 105-113.

True stress-strain diagram; effect of change in one property; proof stress designations.

12-279. **Crack Detection.** *Machinery* (London), v. 65, Sept. 7, '44, pp. 253-256.

Reynolds electro-magnetic equipment for the inspection of welded tubular structures.

12-280. **Exposure Graphs for Radium Radiography of Steel.** A. Morrison and E. M. Nodwell. *Industrial Radiography,* v. 3, Summer '44, pp. 23, 26-29.

The relationships between gamma-ray exposure, thickness of steel, and film density for each of several types of film investigated.

12-281. **Using the Jominy Test to Predict Physical Properties after Tempering.** Earl R. Weiher. *Steel,* v. 115, Oct. 23, '44, pp. 90, 94.

Simple tests also accurately determine hardening

temperature of quenched steel for predetermined hardness and strength.

12-282. **Yield Point and Stress Distribution in Bars and Tubes Due to Plastic Bending.** Eric Bernhult. *Jernkontorets Annaler,* v. 127, no. 10, Oct. '43, pp. 491-533. *Engineers' Digest,* v. 1, Sept. '44, pp. 555-563.

No actual increase in the yield point takes place in bending, the stress conditions being determined by the tensile strength properties of the material. The appearance of the stress distribution characteristic through the cross section will depend upon whether the material has a pronounced lower and upper yield point, or no marked yield point at all.

12-283. **Modern Hardness Testing Machines.** Kurt Meyer. *Fertigungstechnik,* v. 1/77, no. 9, Dec. '43, pp. 232-234. *Engineers' Digest,* v. 1, Sept. '44, pp. 577-578.

Machines for external Brinell and Vickers hardness measurements.

12-284. **The Application of Grain-Size Determination to Magnesium Alloys.** C. H. Mahoney and A. L. Tarr. American Society for Testing Materials *Bulletin,* no. 130, Oct. '44, pp. 15-20.

Importance of a standard method for measuring grain size; proposed method of determination and recording of magnesium grain size.

12-285. **Investigation of Graphitization of Piping.** H. N. Boetcher. American Society for Testing Materials *Bulletin,* no. 130, Oct. '44, pp. 37-40.

Steels showing appreciable service graphitization had relatively large amounts of metallic aluminum (above 0.003%), but not necessarily much aluminum oxide. The effect of normality of the steel on susceptibility to graphitization is being kept in mind. All tests made so far showed the pipe steels to be abnormal, regardless of whether they graphitized in service or not.

12-286. **How Filtering of X-Ray Beams Improves Radiograph Quality.** Robert Taylor. *Aero Digest,* v. 47, Oct. 1, '44, pp. 88-89, 214.

The use of metallic filters offers a means for altering the radiation to meet the varying conditions imposed by different metals and alloys.

12-287. **Determination of Surface Quality.** *Light Metals,* v. 7, Oct. '44, pp. 497-505.

A new sensitive photo-electric method for the evaluation of surface finish. Results of the method are compared with those obtained by other techniques. 4 ref.

12-288. **Steel for Irregular-Shaped Parts Selected on Basis of Hardenability.** A. L. Boegehold. *Automotive Industries,* v. 91, Oct. 15, '44, pp. 18-21, 92, 94, 96, 98.

The determination of hardnesses throughout the part after quenching from the hardening temperature and substitution of cooling rates corresponding to those hardnesses picked from a hardenability curve for the same steel that was used to make the part.

12-289. **2-Million Volt X-Ray Tube.** *Electronic Industries,* v. 3, Nov. '44, pp. 79, 226.

The development of a two-million volt sealed-off X-ray tube by the Machlett Laboratories, Springdale, Conn., for the first time makes it practical to radiograph thick metal sections by reducing the exposure time, for example, from a week with a million volt X-ray system to less than an hour.

12-290. **Fluoroscopic Inspection of Light Metal Castings Used to Supplement Radiography.** Robert Taylor. *American Foundryman,* v. 6, Nov. '44, pp. 6-9.

Discusses the process, its applications and its limitations, and describes available equipment for its industrial use.

12-291. **Fatigue-Testing Methods and Equipment.** H. W. Foster and Victor Seliger. *Mechanical Engineering,* v. 66, Nov. '44, pp. 719-725.

Design of fatigue testing apparatus, and the methods and equipment developed. 6 ref.

12-292. **Radiography—Key to Better Casting Design.** *Foundry,* v. 72, Nov. '44, pp. 76-79.

Use of X-ray equipment as a development tool.

12-293. **Surface Roughness Standards for Tactual Comparisons.** James A. Broadston. *Product Engineering,* v. 15, Nov. '44, pp. 756-759.

Types of roughness standard specimens commercially available explained. New methods for specific designation of defined roughness limits are described with a recommendation that national standardization conform to defined values based on actual measurements.

12-294. **Selecting Steel on the Basis of Hardenability.** A. L. Boegehold. *Machine Design,* v. 16, Nov. '44, pp. 129-134, 166.

Correlation of hardness and strength; securing "full hardening"; determining acceptable hardness.

12-295. **Two-Million-Volt X-Ray Tube.** *Welding Engineer,* v. 29, Nov. '44, p. 51.

Precision X-ray tube.

12-296. **Shall We Qualify the Operator?** W. A. Pearl. *Welding Engineer,* v. 29, Nov. '44, pp. 52-53.

Test specifications; X-ray and tensile tests; ductility test; results.

12-297. **Integrated Inspection.** *Steel,* v. 115, Nov. 13, '44, pp. 131, 172.

Planned installations of X-ray units utilizing from 5000 to 1 million volts provide accurate, dependable examination of a great variety of material and insure flawless quality.

12-298. **Factors Influencing Exposure Times in the Radiography of Metals.** R. L. Durant. *Metal Treatment,* v. 11, Autumn '44, pp. 151-156, 160.

The use of experimentally determined exposure curves in a wide variety of conditions for the routine examination of metals by gamma radiography. Factors which influence the density of the exposed photographic film.

12-299. **Radiography for Development and Control of Aluminum Alloy Spot Welding.** G. W. Scott, L. G. Sut-

ton and J. H. Widmyer. *Welding Journal,* v. 23, Nov. '44, pp. 560-s-570-s.

Determine the optimum procedure and equipment for rapid, routine spot-weld radiography of 24-ST Alclad and 61-SW alloys. Reveal and correlate with macrographs of cross sections many interesting and instructive structural features of welds in these alloys. Identify weld defects. Establish allowable limits for these radiographic defects in production welding that are commensurate with the known influence of the defects on weld strength and with normal factory operating conditions for preweld cleaning and spot welding.

12-300. **Tolerances and Their Effect on Physical Measurements.** Charles Darwin. *Engineers' Digest,* v. 1, Oct. '44, pp. 616-618.

Tolerances have become a respectable part not only of engineering practice, but also of fundamental science.

12-301. **Study of Internal Stresses in a Metal by X-ray Diffraction.** W. A. Wood. Paper for Institute of Mechanical Engineers, March 17, '44, *Engineers' Digest,* v. 1, Oct. '44, pp. 618-620.

Internal strain; X-ray method; stress-strain curve for the atomic lattice; stress determination.

12-302. **How to Improve Accuracy and Efficiency in Measurement and Testing of Gears.** K. Burger. *Maschinenbau der Betrieb,* v. 22, no. 3, March '43, pp. 101-107. *Engineers' Digest,* v. 1, Oct. '44, pp. 637-641.

Testing form of teeth; testing surface of flanks; testing circular pitch and chordal pitch; thickness and width of teeth, and width of space; parallelism of the teeth; testing with regard to collective defects.

12-303. **Fluoroscopic Tests.** *Aircraft Production,* v. 6, Nov. '44, pp. 511-512.

Examination of light-alloy castings.

12-304. **X-ray Diffraction—An Industrial Tool.** J. S. Buhler. *Metals and Alloys,* v. 20, Nov. '44, pp. 1316-1318.

Describes the equipment and discusses industrial applications.

12-305. **Flaw Detection by Paint and Heat.** Harris P. Moyer. *Metal Progress,* v. 46, Dec. '44, pp. 1274-1275.

Detecting flaws in metal by painting the surface of a metal part with thermal indicating paint and then heating the back. Internal flaws affect the heat flow and are indicated by the paint.

12-306. **The Technical Quality Control of Aircraft Parts by Radiography.** J. F. Turbeville. *Western Metals,* v. 2, Nov. '44, pp. 72-74.

Defects reported on the X-ray report form, together with a code number indicating their magnitude.

12-307. **Service Failure of Forging Die Shanks.** John Vanas. *Steel Processing,* v. 30, Nov. '44, pp. 718-720.

Elimination of fatigue-producing stresses; stress dissipated.

12-308. **Fracture Type, Microstructure and Strength Properties of Some Aluminum Die-Cast Test Bars.** James Erickson. *Light Metal Age,* v. 2, Nov. '44, pp. 24-25, 28.

Presence of inescapable air in the die cavity, during

casting, tends to lower physical properties. Improved methods of air escape will result in increased physical properties. A modified structure is retarded when high silicon aluminum alloys are used.

12-309. **The Effect of Long Annealing at Low Temperature on the Elastic Limit of Low-Carbon Steel.** A. Pomp and A. Eichinger. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* v. 26, no. 4, '43, pp. 51-58. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 159-A.

An investigation described, the object of which was to determine how storing at room temperature and long-time annealing at 200° C. affected the appearance of Lüders lines when specimens of low carbon steel, quenched in water from 700° C., were subjected to tensile tests. Seven steels containing from 0.02 to 0.20% of carbon were tested. Normally annealed steel after treatment at 200° C. for 2000 hr. had a clearly defined elastic limit accompanied by Lüders lines. Quenching in water from 700° C. caused the complete disappearance of the plastic range and at the same time increased the deformation resistance. Annealing at 200° C. for only 10 hr. caused specimens tested at room temperature to exhibit a definite elastic limit accompanied by very fine Lüders lines. The difference between the elastic limits of the water-quenched normally annealed steel with and without treatment at 200° C. for 2000 hr. was in some cases quite small, although their lattice constants differed considerably. Increasing the annealing time at 200° C. caused the width of the Lüders bands to increase, but, even after 2000 hr. treatment, they were narrower than those on the normally-annealed specimens.

12-310. **Fatigue Strength of Crankshafts of Large Diesels.** E. Lehr and F. Ruef. *MTZ Motortechnische Zeitschrift,* v. 5, no. 11/12, Dec. '43, pp. 349-357. *Engineers' Digest,* v. 1, Nov. '44, pp. 659-662.

Cyclic torsional fatigue strength with special attention to the influence of flaws of the kind revealed by the magnaflux method.

12-311. **The Effect of Specimen Shape on the Elongation in Tensile Testing.** G. Malmberg. *Jernkontorets Annaler,* v. 128, no. 6, '44, pp. 197-245. (In Swedish.) Abstract Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 160-A.

An investigation of the effects of changes in the length and section of tensile test specimens is described. The elongation at fracture of cylindrical specimens is independent of the diameter provided that the ratio of the gage length to the diameter remains constant. With rectangular specimens having a constant width to thickness ratio the elongation decreases with increasing area of the cross-section. With a constant cross-sectional area the elongation remains practically constant provided that the width to thickness ratio does not exceed three. When this ratio increases above three the elongation increases, especially with short gage lengths. When necking occurs the resulting non-uniform elonga-

tion extends along the whole specimen until it meets the restrictive influence of the specimen heads; it is therefore not possible to calculate the elongation on an arbitrary length when the elongations of the gage lengths are known. Increasing the strain rate decreases the elongation. A very slight irregularity of the gage-length surface lowers the elongation considerably. The restrictive effect of the specimen heads on the elongation extends for 1.5 to 3 times the diameter of the head, a fact which must be borne in mind when acceptance test conditions are changed from a high length to diameter ratio to a low one. A reduction in length takes place at the moment of fracture; this contraction is greatest near the specimen heads and increases with increasing tensile strength.

12-312. **Modern Hardness Testing Machines.** K. Meyer. *Fertigungstechnik,* v. 1944, no. 2, Feb. '44, pp. 47-51. *Engineers' Digest,* v. 1, Nov. '44, pp. 671-673.

Optical hardness testers with integral microscope. Brivisor 3000.

12-313. **Machine for Synchronized, Combined Bending and Torsional Fatigue Tests.** E. Bruder. *Zeitschrift des VDI,* v. 87, no. 5/6, Feb. 6, '43, p. 82. *Engineers' Digest,* v. 1, Nov. '44, p. 678.

Testing machine which allows synchronized loading in both bending and torsion in conformity with actual conditions.

12-314. **The Phenomenon of Metal Fatigue.** *La Technique Moderne,* v. 35, nos. 23 and 24, Dec. 1 and 15, '43, pp. 189-190. *Engineers' Digest,* v. 1, Nov. '44, p. 685.

Fatigue limit of metals depends upon the composition of the metal itself, its heat treatment, the kind of stress to which it is subjected, the magnitude of the superimposed static stress, the internal stress distribution in the piece.

12-315. **The Effect of a Coating of Polybutene on the Fatigue Properties of Lead Alloys.** Lawrence Ferguson and George M. Bouton. American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, Symposium on Stress-Corrosion Cracking. Preprint no. 27, Nov. '44, 10 pp.

Data which show the effect of coatings of a number of different materials on the fatigue life of four lead alloys. Coating material must be in fluid form wetting a fatigue specimen in order to have an effect. Theory of the mechanism of the action of effective coatings is given. 2 ref.

12-316. **Metal Inspection Plays Important Role in Wartime Maintenance Program.** *National Petroleum News,* v. 36, Dec. 6, '44, pp. R-863, R-866-R-867.

Periodic metal inspection of refinery equipment installed in the wartime program as it was necessary for the designer to use substitute steels and other metals for grades normally used. Experience lacking as to how these materials will stand up in actual practice.

12-317. **Setting Tolerances Scientifically.** William B. Rice. *Mechanical Engineering,* v. 66, Dec. '44, pp. 801-803.

Producing usable articles economically; set tolerances that can be met; quality an economic problem.

12-318. **Cheap High-Duty Steels.** J. Edmiston. *Metallurgia,* v. 30, Oct. '44, pp. 304-305.

As a result of experience under wartime conditions, the future trend in steelmaking may be production to physical properties, rather than to chemical specification, and attention given to possibilities and limitations of most economical types of alloy. "Residuals" in war scrap can be used with advantage in the production of high duty alloy steels economically.

12-319. **The Place of X-Ray Equipment in Industry.** John L. Bach. *Machinery,* v. 51, Dec. '44, pp. 174-177.

Applications of recently developed X-ray inspection equipment in the mechanical industries.

12-320. **Investigations on the Heat of Friction and the Temperature Changes during Wear Tests.** E. Siebel & R. Kobitzsch. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* v. 26, no. 7, '43, pp. 97-106. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 162-A.

In the first part of the paper equations are derived for calculating the heat developed by the friction of two surfaces in sliding contact. In the second part dry wear tests are described in which the temperature distribution was determined when specimens of copper, zinc and bakelite were pressed against a revolving steel ring. Rubbing speeds of over 3 m. per second and pressures exceeding 100 kg. per sq. cm. were used. In the copper-to-steel test the temperature steadily increased during the whole test period of 16 sec. With zinc and with bakelite maximum temperatures were reached and maintained for the remainder of the test. This was due in the case of zinc to the formation of a liquid phase, and in the case of bakelite to decomposition. Temperature measurements showed that these phenomena were confined to thin surface layers. When these stages were reached no further wear in the steel took place.

12-321. **Creep Phenomena in Steel at Room Temperature.** A. Pomp and A. Krisch. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* v. 26, no. 5, '43, pp. 59-69. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 163-A.

The results of room temperature creep tests on six unalloyed steels, three chromium-nickel-molybdenum steels, a 14.8% chromium steel and an 18-8 chromium-nickel steel are reported. With one of the unalloyed steels the creep fell to zero within 5 hr. (as far as could be ascertained with the apparatus used), but with the other unalloyed steels and one austenitic steel creep continued after several hundred hours. In some cases creep continued right up to fracture.

12-322. **Endurance Strength of Screw Threads at Different Temperatures and the Influence of Surface Compression Upon It.** Werner Bertram. *Mitt Wohler-Inst.-Braunschweig,* no. 37, '40, pp. 1-52; *Chem. Zentr.,* II, '41, pp. 2488-9. *Alloy Metals Review,* v. 3, Sept. '44, p. 1.

With equal plastic deformation of the threaded section the surface compression increases in proportion to the notch sensitivity of the material. For threads of a given measurement, the most favorable deformation is the same for all materials. By cold deformation of the surface layer, the fatigue strength, even at high temperatures, is greatly increased. On 1⅛-in. threads of steel containing 0.22% C, 0.99% Cr, 0.05% V, 0.90% Mo and of steel containing 0.26% C, 1.29% Cr, 1.33% Mo, an increase in endurance strength of 60 to 80% is obtained by surface compression at 300°, 30% at 500° and 10 to 15% at 600°.

12-323. **A Case for the Qualitative Inspection of Surface Finish.** H. Peter Jost. *Machinery* (London), v. 65, Nov. 2, '44, pp. 483-486.

Whether the methods that prove effective in the laboratory are to be recommended in workshop practice.

12-324. **Influence of Rate of Strain and Temperature on Yield Stresses of Mild Steel.** M. J. Manjoine. *Journal of Applied Mechanics,* v. 11, Dec. '44, pp. A-211-A-218.

Tensile tests are reported for room temperature, 200, 400, and 600° C, at rates of strain which vary from 10^{-6} to 10^{3} per sec. The results plotted to show more clearly the effects of strain-aging on the yield stresses and ultimate stress. The comparison of the yield stress at various strain rates permits an analysis of the influence of strain. Conditions necessary for discontinuous yielding described and compared with test experiences. 13 ref.

12-325. **Predicting Ultimate Failure Loads.** Leon Beskin. *Machine Design,* v. 16, Dec. '44, pp. 117-124.

Margin of safety against failure by fracture depends upon the plastic behavior of material rather than the elastic action commonly assumed in calculating working stresses. Author develops equations and charts for predicting the ultimate failure loads of parts subjected to bending and to eccentric loading.

12-326. **Selecting Steel on the Basis of Hardenability.** A. L. Boegehold. *Machine Design,* v. 16, Dec. '44, pp. 125-130.

Hardness-cooling-rate patterns.

12-327. **Radiographs—What They Tell Designers.** Leslie W. Ball. *Machine Design,* v. 16, Dec. '44, pp. 135-140.

Radiography used for reduction of service failures and wasted machining costs must achieve these objectives in a more reasonable and economical way.

12-328. **Vibration and Noise—Causes and Cures.** Colin Carmichael. *Machine Design,* v. 16, Dec. '44, pp. 141-146, 200, 202.

Torsional vibration. 7 ref.

12-329. **Selecting Surface Quality for Machined Parts.** James A. Broadston. *Machine Design,* v. 16, Dec. '44, pp. 165-168.

Data sheet for the guidance of designers in selecting and specifying roughness numbers for satisfactory performance with minimum cost.

12-330. What's Ahead in Inspection. *American Machinist*, v. 88, Dec. 21, '44, pp. 91-98.

Proper inspection will reduce scrap losses; fixed solid gages improved upon; gaging elements combined to make useful tools; air gages speed rifle barrel inspection; optics used in inspection devices; much special equipment developed for war production; complicated electric gages check many dimensions; surface inspection gains in importance; inspection machines perform tedious jobs; what is ahead in inspection; tolerances to be chosen more wisely.

12-331. Development and Testing of Triaxial Tension Specimens. *Welding Journal*, v. 23, Dec. '44, pp. 642-S-647-S.

Method for Producing Triaxial Tension, by Michael J. Manjoine. A Method of Producing a State of Hydrostatic Tensile Stress in the Interior of Test Pieces, by M. Hetenyi. Cylinder With Axial Pressure Slot in Wall, by L. E. Grinter. Triaxial Tension Test Specimen, by H. C. Boardman. A Suggested Triaxial Specimen, by A. P. Young. Specimens for Triaxial Stress Tests, by Joseph Marin.

12-332. Concerning the Term "Strengthening". W. Spath. *Metall-Wirtschaft*, v. 22, nos. 30-32, Sept. 20, '43, pp. 434-436.

The term "strength" is often used in describing two different properties of materials; namely, strength and hardness. The conception of these two properties is more sharply defined through an analysis of static and dynamic stress-strain diagrams.

12-333. A Note on the Physical Properties of an Austenitic Weld-Metal and Its Structural Transformation on Straining. K. Winterton. Iron and Steel Institute, Advance Copy, Nov. '44, 5 pp.

Mechanical tests at elevated temperatures on composite 18-8 weld-plate tensile specimens, showed that tensile strength, yield strength and hardness declined with increased testing temperatures. Elongation was at a maximum when testing at 250° C. Effect of prior heat treatment at 850° C. in causing increased tensile strength and decreased yield strength decreased with testing temperature and was not apparent above 150° C. Microscopic examination showed a breakdown of dendritic regions to a light-etching alpha-constituent, and the formation of lines and blocks of a deep-etching alpha-constituent, probably due to uneven straining. **3 ref.**

SECTION XIII

TEMPERATURE MEASUREMENT AND CONTROL (PYROMETRY)

13-1. **Constant Heating Rate Control.** R. J. Smith. *Metal Industry,* v. 63, no. 26, Dec. '43, pp. 402-404.

Control of heating and cooling rate based upon the combined principles of the rectifier ammeter (for anticipation power change) and the thermocouple (for initiating power equipment to produce temperature change). Either millivoltmeter or potentiometric equipment may be used to control power-controlling equipment such as resistors or auto-transformers.

13-2. **Spherical Furnace Calorimeter for Direct Measurement of Specific Heat and Thermal Conductivity.** *Industrial Heating,* v. 11, no. 1, Jan. '44, p. 126.

Thermal conductivity is measured by determining the inner and outer sample temperature at steady heat flow; specific heat is measured by noting temperature rise of sample with a known heat input while maintaining the calorimeter shells near the adiabatic condition.

13-3. **Thermostatic Expansion Valves for Low Temperature Applications.** F. Y. Carter. *Refrigerating Engineering,* v. 47, Feb. '44, pp. 96-98.

With the rapidly increasing use of lower temperature in refrigeration, no problem is more important than controls for low temperature work. Here the author describes various types of systems.

13-4. **Technique for Determining Temperatures in the Interior of a Freezing Ingot.** *Industrial Heating,* **v. 11,** Feb. '44, pp. 252, 254.

Method for accurately measuring temperature conditions within a freezing ingot.

13-5. **Survey of Liquid Steel Temperatures in Basic Open-Hearth Furnaces.** D. Manterfield. *Metallurgia,* **v.** 29, Jan. '44, pp. 141-144.

Details are given of the type of furnace and slag dealt with in the survey. The second part concerns the temperature fluctuations during the progress of a heat. The uniformity of temperature in the bath is shown to be governed by its activity.

13-6. **Control Equipments for Induction Heating.** F. E. Ackley. *General Electric Review,* v. 47, March '44, pp. 16-21.

Modern control equipments for both core and coreless types of induction furnaces.

13-7. **Furnace Control Operated from the Load Temperature.** O. G. Pamely-Evans. *Metallurgia,* v. 29, Feb. '44, pp. 171-175.

The trend towards lower furnace temperature, as close as possible to the actual temperature required in the metal, necessitates closer operating control of the furnace, and while many factors must be considered in achieving uniformity in heating, the load temperature is the primary consideration. Using the radiant tube furnace as a basis, the author discusses control of the furnace operated from the load temperature.

13-8. **Built-in Automatic Temperature Controls.** V. G. Vaughan. *Machine Design,* v. 16, April '44, pp. 129-133.

Potential applications, advantages and forecast for built-in temperature controls.

13-9. **Control Equipments for Induction Melting and Heating Units.** F. E. Ackley. *Industrial Heating,* v. 11, April '44, pp. 538, 540, 542, 544, 546, 580.

Controls for low frequency equipment, controls for higher frequency equipment, instrumentation, contactors, overload protection.

13-10. **A Thermocouple Method for the Measurement of Liquid Steel Casting-Stream Temperatures.** D. A. Oliver and T. Land. The Iron and Steel Institute Advance Copy, 5/1943, March '44, 9 pp.

Method of measuring the true temperature of the liquid steel in the casting stream. A platinum/platinum-rhodium thermocouple, lightly sheathed in silica, was allowed to protrude into the narrow part of the conical refractory lining of a runner box. The e.m.f. of the thermocouple was applied to a mains-driven high-speed amplifier and recorder, which showed that a steady temperature was attained in approximately 15 sec. The application of this method is illustrated.

13-11. **Barrier-Layer Photo-Electric Cells for Temperature Measurement.** T. Land. The Iron and Steel Institute Advance Copy, 6/1943, March '44, 31 pp.

Selenium barrier-layer photo-electric cell offers many advantages for the measurement of temperatures in the foundry. Such cells have previously been used for temperature measurement, but little has been known about their limitations or their calibration. Ten cells were investigated and their fatigue, their temperature coefficients and their departure from linear response were determined. The calibration of each cell was established, using a black-body furnace and a tungsten-ribbon filament lamp. 16 ref.

13-12. **The Emissivity Characteristics of Hot Metals, with Special Reference to the Infra-red.** D. J. Price and H. Lowery. The Iron and Steel Institute Advance Copy, 7/1943, March '44, 24 pp.

Theoretical and practical considerations in connection with the study of emissivity and the relevant

literature are critically surveyed. The application of emissivity data to the correction of pyrometer readings has been examined and the necessity of an adequate knowledge of emissivity data is indicated. 64 ref.

13-13. **The Drift of Selenium Photo-Electric Cells in Relation to Their Use in Temperature Measurement.** J. A. Hall. The Iron and Steel Institute Advance Copy, 26/1943, March '44, 11 pp.

Experiments made to investigate the "drift" effect in selenium barrier-layer photo-electric cells intended to be used for temperature measurement. It was found that the drift of seven of the nine cells examined was too great to permit of their use for the most accurate work.

13-14. **Temperature Reading of Molten Steel.** Eric N. Simons. *Steel,* v. 114, May 15, '44, pp. 98.

Quick-immersion thermocouple is developed in England for determining bath temperatures of molten steel. Immersion tube is made of either diatomite brick or electrode graphite and has a maximum life of six readings.

13-15. **Radiation Pyrometry in Turbosupercharger Testing.** V. P. Head. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 265-269.

With increase in operating temperatures and speeds of turbines such as are used in turbosuperchargers, the demands for turbine-wheel and bucket temperature measurement have become increasingly exacting. Requests appear for such measurements under operating conditions with measurement tolerances varying from $\pm 50°$F. in flight test to $\pm 5°$F. in certain ground tests. Outlines the procedures used for measurements ranging from as low as 300°F. up.

13-16. **High - Speed Multiple - Point Potentiometer Recorder for Measuring Thermocouple Temperatures During Test-Plane Flights.** I. M. Stein, A. J. Williams, and W. R. Clark. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 271-275.

Operating characteristics and performance in flight tests.

13-17. **Control Equipments for Induction Melting and Heating Units: II.** F. E. Ackley. *Industrial Heating,* v. 11, May '44, pp. 716, 718, 720, 722, 724, 742.

Various panel equipments incorporating controls for low frequency equipment, controls for higher frequency equipment, contactors and overload protection and the individual units which comprise in the aggregate the means for regulating electrical induction heating and melting equipment.

13-18. **Thermocouple Method for the Measurement of Liquid Steel Casting-Stream Temperatures.** D. A. Oliver and T. Land. *Metallurgia,* v. 29, April '44, pp. 307-310.

A new method of measuring the true temperature of liquid steel in the casting stream.

13-19. **Bi-Metallic Pyrometer.** E. Stuart Clarke. *(Commonwealth Engineer,* v. 31, Jan. '44, p. 148.) *Engineers' Digest,* v. 1, May '44, p. 336.

Pyrometer requiring an oil temperature in the region of 225° C. correct to ± 5° C.

13-20. **Automatic Control Equipment IV.—Industrial Applications.** W. H. Steinkamp. *Industry & Power,* v. 46, June '44, pp. 69-71.

Controls for the following: Steam superheater, furnace pressure, galvanizing kettle, rotary hearth forge furnace, continuous billet heating furnace, distillation control, and fractionating tower temperature.

13-21. **Saving Man-Hours and Materials Through Gas and Fuel Control Instrumentation Methods.** Edward A. Dieterle. *Instruments,* v. 17, June '44, pp. 326-327, 370-371.

Methods and industrial applications.

13-22. **A Thermocouple Method for the Measurement of Liquid Steel Casting-Stream Temperatures.** D. A. Oliver and T. Land. *Foundry Trade Journal,* v. 73, May 4, '44, pp. 3-6.

A simple and successful method for measuring the temperature of the casting stream in the foundry.

13-23. **Control of Heat Treatment.** A. H. Koch. *Industrial Gas,* v. 23, July '44, pp. 13-17, 30-38.

A high head temperature, importance of control of time, automatic control on furnaces, roller hearth, walking beam furnaces, walking beam popular for large pieces, methods of protecting surface of metals, inert nitrogen, ideal atmosphere, difficulties encountered with CG gas, Char-Mo atmosphere filis requirements, RX gas generator introduced, elimination of cleaning justifies cost, constant quenching temperature.

13-24. **Liquid Steel Temperatures.** D. Manterfield. *Iron & Steel,* v. 17, May 18, '44, pp. 422-424.

Pyrometric survey of the variations in basic open-hearth furnaces.

13-25. **Barrier-Layer Cells.** T. Land. *Iron & Steel,* v. 17, May 18, '44, pp. 462-466.

Use of photoelectric cells for foundry temperature measurements.

13-26. **Selenium Cells.** J. A. Hall. *Iron & Steel,* v. 17, May 18, '44, pp. 467-468.

Drift in relation to temperature measurement.

13-27. **Hot Metals.** D. J. Price and H. Lowery. *Iron & Steel,* v. 17, May 18, '44, pp. 469-473.

Emissivity characteristics, with special reference to the infra-red. 64 ref.

13-28. **Liquid Steel Temperatures.** D. A. Oliver and T. Land. *Iron & Steel,* v. 17, May 18, '44, pp. 474-475.

Thermocouple method for their measurement in casting streams.

13-29. **Liquid Steel Temperatures Measured by Thermocouple.** D. A. Oliver and T. Land. *Iron Age,* v. 154, July 27, '44, pp. 39-41, 124.

A method to give a true reading of temperature variations for liquid steel poured into a ladle by means of an immersion type thermocouple. The results permit this method to supersede the optical pyrometer.

13-30. **Electronic Control for Resistance Furnaces.** Harold J. Hague. *Steel,* v. 115, August 14, '44, pp. 106, 108, 162, 164, 166, 168, 170.

Method for accurately controlling temperatures of heat treating and other furnaces involves simple regulator system.

13-31. **Temperature Measurement of Molten Alloys.** *Alloy Casting Bulletin,* no. 2, July '44, pp. 1-3.

Melting points of HH and HT alloys determined at Battelle. Calibration curves given for obtaining true temperatures with optical pyrometers.

13-32. **Color-Temperature Scale: Part I.** W. E. Forsythe and E. Q. Adams. *General Electric Review,* v. 47, Sept. '44, pp. 26-34.

Lamp or furnace temperature best determined by measuring specific brightness. 14 ref.

13-33. **Temperature Control of Die Casting.** M. D. Pugh. *Tool and Die Journal,* v. 10, Sept. '44, pp. 115-117.

The highest quality of die castings either as to strength, density or finish is dependent on temperature of the metal, temperature of the mold and time cycle of the casting operation.

13-34. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas,* v. 23, Sept. '44, pp. 19-21, 39-40.

The value of electric recording pyrometers, and automatic fuel control in galvanizing furnace operation.

13-35. **Liquid-Steel Temperatures in Open-Hearth Furnaces.** D. Manterfield. *Engineering,* v. 158, Sept. 8, '44, p. 185.

Temperature explorations in the larger type of basic open-hearth furnace.

13-36. **Liquid-Steel Temperatures in Open-Hearth Furnaces.** D. Manterfield. *Engineering,* v. 158, Sept. 15, '44, p. 205.

The relative slag and metal temperatures.

13-37. **Improved Control Through Use of Transparent Thermocouple Protecting Tubes.** J. P. Vollrath. *Industrial Heating,* v. 11, Oct. '44, pp. 1619-1620, 1708, 1710.

Vycor, a transparent glass of 96% silica, provides rapid response to temperature changes, facilitating extremely close temperature control. Results described.

13-38. **Operating the Continuous Furnace by Automatic Temperature Control.** *Industrial Heating,* v. 11, Oct. '44, pp. 1622, 1624, 1632.

The successful application of automatic control of any furnace requires three things: a good furnace of proper design, good burners, and good control equipment.

13-39. **Steelworks Pyrometry.** A Linford. *Iron & Steel,* v. 17, Oct. '44, pp. 632-636.

Principles and applications of radiation and optical instruments.

13-40. **Ratio and Multiple-Fuel Controls in the Steel Industry.** Herbert Ziebolz. American Society of Mechanical Engineers *Transactions,* v. 66, Nov. '44, pp. 705-721.

Methods used and the apparatus which were developed and discussed are: The basic ratio control, the control mixing stations, and the controls available for burning several fuels simultaneously with only one common supply for combustion air. 8 ref.

13-41. **Measurement of Casting-Stream Temperatures.** D. A. Oliver and T. Land. *Metal Treatment,* v. 11, Autumn '44, pp. 145-150, 144.

Investigations, employing a platinum/platinum-rhodium thermocouple method for measuring the true temperature of liquid steel casting streams.

13-42. **Three-Zoned Temperature Control on a Continuous Furnace.** B. M. Putich. *Iron & Steel Engineer,* v. 21, Nov. '44, pp. 35-43.

Automatic temperature control applied to all three zones of a continuous heating furnace gives more production, better quality and higher efficiency.

13-43. **Steelworks Pyrometry.** A. Linford. *Iron & Steel,* v. 17, Nov. '44, pp. 671-675.

Principles and applications of radiation and optical instruments.

13-44. **Thermocouple Method for the Measurement of Liquid Steel Casting-Stream Temperatures.** D. A. Oliver, and T. Land. Paper for the Iron & Steel Institute, London. *Engineers' Digest,* v. 1, Nov. '44, pp. 667-668.

"Temperature ring" of arc-furnace electrode graphite. Thermocouple protected by a silica tube, which projected about one inch from the graphite in the narrow part of the funnel.

13-45. **High Temperature Measurements of Liquid Steels Using the Quick-Immersion Thermocouple Technique.** R. W. S. Freeman. *Canadian Metals & Metallurgical Industries,* v. 7, Dec. '44, pp. 23-25.

Construction of equipment. Application of the method developed by Schofield and Grace for the measurement of high temperatures in liquids.

SECTION XIV

FOUNDRY PRACTICE AND APPLIANCES

14-1. **The Future of Magnesium Castings.** D. Basch. *Foundry,* v. 72, no. 1, Jan. '44, pp. 116, 199-202.

Advantages of Mg castings: Light weight, excellent machinability, damping characteristics, high fatigue strength, non-sparking, non-magnetic. Disadvantages: Modulus of elasticity lower than Al; if stiffness is needed, Mg must be 17% thicker in sections.

14-2. **Casting Manganese Bronze.** John S. Roberts. *Foundry,* v. 72, no. 1, Jan. '44, pp. 100-101, 158-159.

To attain desired physical properties in Mn bronze castings tensile strength in the ingot should be specified 5000-10,000 psi. higher than the minimum required in the casting. Elongation in the ingot should also be higher. Melting and casting and fuel requirements given.

14-3. **Tests Graphite Rods in Producing Cast Steel.** F. J. Vosburgh and H. L. Larson. *Foundry,* v. 72, no. 1, Jan. '44, pp. 108-111, 194.

Carbon vs. graphite rods used to reduce metal loss in risers of steel castings.

14-4. **Steel Castings.** Edwin Bremer. *Foundry,* v. 72, no. 1, Jan. '44, pp. 104-105, 184-185.

Furnace details, power requirements, metal charge, slag samples.

14-5. **Increases Corebox Life.** Horace L. Dudley. *Foundry,* v. 72, no. 1, Jan. '44, pp. 103, 169-171.

Design data.

14-6. **Duplexing in Malleable Iron Production.** Donald J. Reese. *Foundry,* v. 72, no. 1, Jan. '44, pp. 98-99.

In the past 15 years production of blackheart malleable iron has been changing from air furnaces (reverberatory) to continuous melting with duplex system.

14-7. **New Gray Iron Foundry Makes Machine Tool Castings.** William G. Gude. *Foundry,* v. 72, no. 1, Jan. '44, pp. 112-115, 195-198.

Plant layout.

14-8. **Foundry Industry Makes Progress in Practice and Product.** *Foundry,* v. 72, no. 1, Jan. '44, pp. 106-107, 186.

1944 forecast for bronze castings, advances in steel castings and gray iron industry, boron in malleable,

future specifications to be more exact, manpower shortage cuts non-ferrous output.

14-9. **Metallurgical Factors of Importance to the Practical Aluminium Founder.** S. A. E. Wells. *Foundry Trade Journal,* v. 71, no. 1422, Nov. 18, '43, pp. 225-228.

Discussion on repeated melting of Alpax Gamma with and without flux additions, loss of Mg, burning of Al, Zn content and grain size.

14-10. **Metallurgical Factors in Importance to the Practical Aluminium Founder.** S. A. E. Wells. *Foundry Trade Journal,* v. 71, no. 1420, Nov. 4, '43, pp. 179-184.

Grain refining; influence of Al on grain. Gases—occurrence, causes and removal; elimination of pinholes; loss of Mg.

14-11. **The Production of Bronze Castings for the Merlin Engine.** John Allan. *Foundry Trade Journal,* v. 71, no. 1424, Dec. 2, '43, pp. 261-266, 273.

Si bronze, gravity die-casting, exhaust valve guides, Al bronze.

14-12. **Production of Truncated Pistons.** A. H. Climas. *Foundry Trade Journal,* v. 71, no. 1423, Nov. 25, '43, pp. 245-247.

Description of molding and coring practice.

14-13. **High-Grade Cast Iron from Low Pig-Iron Cupola Charges.** J. E. Rehder. *Foundry Trade Journal,* v. 71, no. 1424, Dec. 2, '43, pp. 267-272.

Cupola charge composition, pig-iron, remelt and borings, coke, cupola operation, and inoculation practice.

14-14. **Blackheart and Pearlitic Malleable Cast Irons.** Bureau of Mines Report. *Foundry Trade Journal,* v. 71, no. 1423, Nov. 25, '43, pp. 239-244.

Composition, properties, and uses of blackheart malleable iron; pearlitic malleable iron, Promal, Arma-Steel, and Z-Metal.

14-15. **Notes on Oil-Sand Practice in the Ordinary Foundry.** Wm. Y. Buchanan. *Foundry Trade Journal,* v. 71, no. 1425, Dec. 9, '43, pp. 291-294.

Type of sand used, grain size, making binders in the foundry, storage and drying.

14-16. **Copper Alloy Castings.** H. J. Miller. *Canadian Metals & Metallurgical Industries,* v. 6, no. 12, Dec. '43, pp. 33-36.

Wartime changes in metals, foundry practice and applications in Britain.

14-17. **Carbon Control of Cupola Cast Iron.** H. Kenneth Briggs. *Canadian Metals & Metallurgical Industries,* v. 6, no. 12, Dec. '43, pp. 27-32.

Factors affecting graphitization; coke as a source of carbon; steel, a diluent of carbon; supersaturated irons; melting high strength irons. 8 ref.

14-18. **Future of Magnesium Castings.** D. Basch. *Iron Age,* v. 153, no. 2, Jan. 13, '44, pp. 54-57.

Evaluates the properties of magnesium for sand, die and centrifugal casting; suggests future improvements.

14-19. **Some Malleable Iron Castings Problems.** *Iron Age,* v. 153, no. 3, Jan. 20, '44, pp. 68-69.

The gating of castings, preservation of chills, and use of synthetic sands.

14-20. **Mass Production Casting of Bombs.** *Iron Age,* v. 153, no. 2, Jan. 13, '44, pp. 64-66, 134.

Casting of 500-lb. bombs with maximum steel scrap and minimum ferro-silicon.

14-21. **Zinc Die-Casting Alloys.** S. W. K. Morgan and B. D. Darrah. *Metal Industry,* v. 63, no. 23, Dec. 3, '43, pp. 354-356.

Mechanical properties at subnormal temperatures, comparison of physical properties, theoretical considerations, X-ray examination. 8 ref.

14-22. **Moulding Large Bronze Propellers.** *Metal Industry,* v. 63, no. 25, Dec. 17, '43, pp. 389-391.

Foundation plates, rigid mould, ramming the cope, and cores.

14-23. **Machines for Die-Casting.** *Aircraft Production,* v. 5, no. 62, Dec. '43, pp. 599-600.

New low-temperature, high-pressure equipment.

14-24. **Continuous Pouring of Magnesium Engine Castings.** *Aviation,* v. 43, no. 1, Jan. '44, pp. 150-159.

How Chevrolet converted its iron foundry to make magnesium engine castings.

14-25. **A Method of Correlating Foundry Practice and Quality of Light Alloy Castings.** H. G. Warrington. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 45-49.

Methods of production of aeroplane casting to keep loss at a minimum.

14-26. **Why Die Casting?** *Die Casting,* v. 1, no. 2, Dec. '43, pp. 18-20.

Machining and finishing.

14-27. **Why Die Casting?** *Die Casting,* v. 2, no. 1, Jan. '44, pp. 32, 34.

Advantages are casting speed and high production rate. Comparison to sand casting and stamping.

14-28. **Tooling for Tools.** F. J. Koenig and H. F. Linder. *Die Casting,* v. 2, no. 1, Jan. '44, pp. 35-36.

Smooth surface finish, clean lines and sharp detail of die castings are important factors in their success.

14-29. **Economy in a Housing.** *Die Casting,* v. 2, no. 1, Jan. '44, pp. 18, 20.

Designers familiar with the possibilities of die castings and the way they can simplify manufacture are making them count in achieving minimum costs without any offsetting disadvantage and often with gains other than those of economy in cost.

14-30. **Aircraft Magnetos.** Walter K. Dow. *Die Casting,* v. 2, no. 1, Jan. '44, pp. 28-32.

Development of die casting due to (1) advantages to user and consumer (2) molded plastics competition with die castings (3) advantages to producer of die castings.

14-31. **Copper Rings Centrifugally Cast.** *Western Metals,* Jan. '44, p. 12.

Method of casting copper rings centrifugally used at General Electric's Schenectady works.

14-32. **Trends in Iron Foundry Metallurgy.** J. S. Vanick. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 83-85.

Hot blast systems, humidifying installations, duplex melting, inoculation and heat treatment of cast iron.

14-33. **Precision Casting.** *Steel,* v. 114, no. 2, Jan. 10, '44, pp. 78-82, 96.

New production tool used on parts weighing 5-7 lb. with high strength factors and close dimensional limits.

14-34. **The Use of Intensifiers in Iron Castings.** Fred C. T. Daniels. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 94-95.

The effect of the use of various intensifiers in iron castings, particularly the use of boron.

14-35. **Mass Production Casting of Bombs.** *Iron Age,* v. 153, no. 2, Jan. 13, '43, pp. 64-66, 134.

The casting of 500-lb. bombs with maximum steel scrap and minimum ferro-silicon. Particularly interesting is the fact that the foundry uses a satisfactorily-working, well synchronized triplex method.

14-36. **Control of Cast Iron.** Whiting Lathrop. *Canadian Metals & Metallurgical Industries,* v. 7, no. 1, Jan. '44, pp. 12-16.

Making better castings in the smaller foundry. Raw materials, steel scrap, cast iron scrap, ferro-alloys, pig iron. Quality control.

14-37. **Quality of Castings Begins in the Foundry.** William G. Reichert. *Foundry Trade Journal,* v. 71, no. 1427, Dec. 23, '43, pp. 323-328.

14-38. **The Halifax Undercarriage Bridge Casting.** J. A. Oates. *Aircraft Production,* v. 6, no. 63, Jan. '44, pp. 21-31.

Foundry production methods; machining sequence; extensive use of horizontal boring machines tooled for quantity production work.

14-39. **Design of a Front Slagging Cupola Spout.** R. D. Petcher. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44, pp. 706-708.

Details of a front slagging spout; both the molten metal and slag are carried together through the cupola breast or tap-hole into a trough. The metal then flows under a slag dam, while the slag floats on the metal and runs off at the side of the spout into a slag ladle. The clean metal then flows over the lip of the spout into a receiver from which it is distributed, by means of conventional transfer ladles, to the molding floors.

14-40. **Factors in the Production of Quality Castings.** William G. Reichert. *Foundry,* v. 72, no. 2, Feb. '44, pp. 115, 199-202.

Basic principles for obtaining properly designed castings and effect of pattern upon quality.

14-41. **Tests of Pattern Coating Substitutes for Shellac.** Frank C. Cech. *American Foundrymen's Association Transactions,* v. 51, no. 3, March, '44, pp. 732-736.

The findings of the paper were based on a national survey of shellac and varnish manufacturers, pattern supply houses, pattern manufacturers and foundries. The survey revealed that: 1. Varnish manufacturers

had given but little thought to special pattern coatings. 2. Pattern supply houses found pattern manufacturers relatively unwilling to try new coatings. 3. Pattern manufacturers were content to use the traditional coating—shellac.

14-42. **Structure Control of Gray Cast Iron.** R. G. McElwee and Tom E. Barlow. *Foundry,* v. 72, no. 2, Feb. '44, pp. 112-114, 177, 178.

The difference between alloying and inoculation, basic function of inoculation, undesirable gray iron structure, and effect of cooling rate.

14-43. **Precision Castings.** L. L. Wyman and D. Basch. *Foundry,* v. 72, no. 2, Feb. '44, pp. 116-117, 203-206.

Application of precision casting, utilizing either centrifugal or pressure methods, to the production of precision parts made from heat and corrision resistant alloys. Method, directional solidification, materials.

14-44. **Selecting, Evaluating and Specifying Metallic Materials.** H. W. Gillett. *Foundry,* v. 72, no. 2, Feb. '44, pp. 118-119, 207-214.

Abstract from a report "An Engineering approach to the selection, evaluation and specification of metallic materials." Pertinent data relating to castings.

14-45. **Saginaw Malleable Makes Steel Castings.** Edwin Bremer. *Foundry,* v. 72, no. 2, Feb. '44, pp. 120-121, 191-192.

Sand handling, heat treatment and cleaning.

14-46. **Duplexing in Malleable Iron Production.** Donald J. Reese. *Foundry,* v. 72, no. 2, Feb. '44, pp. 122-123, 173-176.

Discussion of chemistry of the cupola charge. Importance of the time element in tapping is emphasized, and the significance of different variables in cupola operation.

14-47. **Sand Control Reduces Casting Rejects.** D. W. Gunther. *Foundry,* v. 72, no. 2, Feb. '44, pp. 150, 152.

Factors to be considered about a base sand are: Grain size, shape and distribution, clay content, and refractory value. Results with various classes of bonding clays given.

14-48. **Tests Graphite Rods in Producing Cast Steel.** Frank J. Vosburgh and Howard L. Larson. *Foundry,* v. 72, no. 2, Feb. '44, pp. 128-129, 187-188.

The relation of rod size to riser size, and the advantages of the method.

14-49. **Use of Cement in Foundry Molding.** C. A. Sleicher. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44, pp. 737-747.

Principles and reactions in the use of cement in foundry molding are explained. Reasons are given for the value of cement in molding, some of which are lower material costs, savings in labor, fuel and power, higher casting quality. The problems involved in the use of cement including the proper mixture, method of mixing and drying time for cement molds, with considerable stress placed on the importance of the mold blacking operation.

14-50. Stress Relief and the Steel Casting. E. A. Rominski and H. F. Taylor. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44 pp. 709-731.

Locked-up internal stresses resulting from the method of manufacture and/or heat treatment may affect the service life and dimensional stability of structures. The problem undertaken at the Naval Research Laboratory is in two parts: (1) A determination of rates of relief of stress as a function of temperature, and (2) a stress analysis of castings under various conditions of cooling. This paper describes a special method for determining relaxation rates of steel or other metals. The stress relieving time under prescribed conditions can be readily computed with sufficient accuracy from two or more observations upon each kind of steel at each of two or more temperatures.

14-51. A Study of "Burnt-On" or Adhering Sand. J. B. Caine. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44, pp. 647-705.

"Burnt-on" sand is the result of metal penetration of large voids in the sand, followed by freezing of the metal, which mechanically locks the sand to the casting. In a highly refractory sand, voids may be present on ramming as the result of large grain size. In less refractory sands, voids may be formed by the fusing of the colloidal matter and finer silica particles present in the sand. Metal will penetrate either type of void provided the sand temperature is higher than the melting point of the casting alloy. Metal penetration may also be reduced or prevented either by the formation of a continuous, extremely viscous fused film such as results when hot metal strikes a properly applied silica wash, or by gas pressure such as results when metal heats an organic binder.

14-52. How to Change the Properties of Sand—II. N. J. Dunbeck. *American Foundryman,* v. 6, Feb. '44, pp. 8-12.

Selection and correct use of sand to achieve the desired casting results. "Effect of other additions" on core mixes.

14-53. Core Blowing as a Factor in a Semi-Production Foundry. Z. Madacey. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44, pp. 593-616.

Methods of core blowing and related factors at Caterpillar Tractor Co., citing as some of the factors necessary for successful core blowing, accurate sand control, skilled help and cooperation between every department in the organization involved in core blowing. Core blowing equipment and various large and small cores, giving illustrations of same. Experiments conducted on the production of aluminum aircraft cylinder heads.

14-54. Making Cores for the Steel Casting. S. W. Brinson and J. A. Duma. *American Foundrymen's Association Transactions,* v. 51, no. 3, March '44, pp. 563-592.

Description of the methods of making cores for steel castings as practiced at Norfolk Navy Yard. The importance of proper arbors or reinforcing rods for sup-

porting cores, the use of chaplets and the proper material for producing the best cores. Coke or cinder-filled cores vs. hollow cores, including illustrations of these and other cores, as well as of arbors, arbor beds, stamping boards for arbors, etc.

14-55. **Precision Castings of Turbosupercharger Buckets.** Albert W. Merrick. *Iron Age,* v. 153, no. 6, Feb. 10, '44, pp. 52-58.

War's demand has created a commercial application for a technique heretofore used only in dental and surgical appliances. Small buckets for G. E. aircraft turbosupercharger are being made out of a non-ferrous alloy "Vitallium" that is difficult to machine and forge. History of the development of the investment casting technique for this metal, the various steps in the process of making precision castings from wax patterns.

14-56. **The Future of Magnesium Castings.** D. Basch. *American Foundryman,* v. 6, Feb. '44, pp. 4-7.

Growth and usage of magnesium castings.

14-57. **Aluminum Castings.** Robert E. Wick. *Light Metal Age,* v. 2, Jan. '44, pp. 18-21, 34.

Reviews methods and recommended practice in the steps from designing to finishing aluminum castings. Sand and permanent mold castings are discussed.

14-58. **Foundry Pig Irons and Refined Irons.** E. Morgan. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 220-223.

Utilization of high phosphorus qualities.

14-59. **Elements of Control in the Grey Iron Foundry.** Brian Russell. *Foundry Trade Journal,* v. 72, no. 1429, Jan. 6, '44, pp. 3-8, 2.

Engineering properties of cast irons and their improvement through foundry control.

14-60. **Die Casting of Fuse Bodies.** H. E. Shepard. *Iron Age,* v. 153, no. 7, Feb. 17, '44, pp. 52-59.

By substituting zinc alloy die castings for brass fuse bodies formerly produced on screw machines, manufacturing costs are reduced and amount of scrap generated minimized. Procedure from die casting to machining and final packaging of the fuses for 20-mm. projectiles is outlined in detail.

14-61. **The Use of Basic-lined Ladles in the Desulphurisation of Cast Iron by Sodium Carbonate.** N. L. Evans. *Foundry Trade Journal,* v. 72, no. 1430, Jan. 13, '44, pp. 25-30, 39.

Report of laboratory and works experiments with different lining materials.

14-62. **Notes on Oil-Sand Practice in the Ordinary Foundry.** Wm. Y. Buchanan. *Foundry Trade Journal,* v. 72, no. 1429, Jan. 6, '44, pp. 9-12.

Oil-sand plant, mixing, tests on mixers, design of mixers.

14-63. **Notes on Oil-Sand Practice in the Ordinary Foundry.** Wm. Y. Buchanan. *Foundry Trade Journal,* v. 72, no. 1430, Jan. 13, '44, pp. 35-37.

Useful hints are given on the drying, storage, and handling of cores.

14-64. **Ingenious Designing.** *Die Casting,* v. 2, Feb. '44, pp. 30-31.
Designing dies to produce castings at minimum cost. Side openings without side cores or slides.

14-65. **Alloys for Die Casting—Part II.** *Die Casting,* v. 2, Feb. '44, pp. 32-34.
Advantages of Al for die casting. Limitations and alloy selection.

14-66. **Why Die Casting?** *Die Casting,* v. 2, Feb. '44, pp. 40-42.
Advantages of die castings from the stand-point of variations in wall thickness; shapes and sizes. Appearance and physical property characteristics of die castings with direct comparisons to other fabricating methods.

14-67. **A System for the Impregnating and Polymerizing of Magnesium Alloy Castings.** Industrial Heating, v. 11, Feb. '44, pp. 220, 222.
Production of magnesium alloy metal in the form of castings.

14-68. **Continuous Casting.** T. W. Lippert. *Iron Age,* v. 153, Feb. 24, '44, pp. 48-65, 138, 140, 142, 146, 148.
Hazelett, Merle, Inco, Soro, Pluramelt, Alcoa, Junghans-Rossi, Bethlehem, Eldred-Lindner, Republic and Goss processes.

14-69. **Heavy Castings in Green Sand.** H. Abnett. *Foundry Trade Journal,* v. 71, Dec. 30, '43, pp. 353-354.
Road roller casting, multiple risers, mold finishing, eliminating defects, facing sand and venting.

14-70. **Quality of Castings Begins in the Foundry.** William G. Reichert. *Foundry Trade Journal,* v. 71, Dec. 30, '43, pp. 347-352.
Every factor in foundry practice determines the final quality of castings and merits the closest consideration and control.

14-71. **The Casting of Brass and Gilding Metal Billets.** *Metal Industry,* v. 63, Dec. 31, '43, pp. 423-424.
Fundamental principles in the production of Cu-Zn billets and ingots.

14-72. **Use of Cement in Foundry Moulding.** C. A. Sleicher. *Foundry Trade Journal,* v. 72, Jan. 20, '44, pp. 55-56, 58.
Radical differences between American and British practice.

14-73. **Notes on Oil-Sand Practice in the Ordinary Foundry.** Wm. Y. Buchanan. *Foundry Trade Journal,* v. 72, Jan. 21, '44, pp. 53-54.
Secondary air for core ovens.

14-74. **Continuous Casting.** Leslie H. Day. *Metal Treatment,* v. 10, Winter, '43-'44, pp. 233-238, 267.
Finished and semi-finished strip and sheet, ferrous and non-ferrous, produced straight from molten metal, eliminates the ingot and re-rolling stages. Similar processes for continuously casting bars and tubes on the same principle are already operating in other countries.

14-75. **A Technical Department for Large Foundries Producing Small and Medium Castings.** H. Hayden. *Foundry Trade Journal*, v. 72, Jan. 20, '44, pp. 47-51.

Essential factors for insuring regularity in production.

14-76. **Effect of Casting Conditions on the Properties of a Magnesium Die-casting Alloy.** W. R. D. Jones. *Engineers' Digest*, v. 1, Feb., '44, pp. 164.

Effects of tapered mold and group casting molds outlined and variation in amounts of alloying substance. Influence exerted by superheating temperature and microporosity.

14-77. **Development of the Pressure Die-Casting Industry.** H. Skelding. *Metal Treatment*, v. 10, Winter, '43-'44, pp. 249-254.

With the large increase in the demand for Zn over the last few years, some manufacturers have undertaken production without the requisite knowledge or skill with the result that some users, having been supplied with an inferior product, have condemned the process generally. Deals with some of the difficulties encountered in production of Zn-base die castings and gives guidance to manufacturers and users alike in solving these problems.

14-78. **Molds Laundry Machinery Castings.** Pat Dwyer. *Foundry*, v. 72, March '44, pp. 100-102, 162.

Description of American Laundry Machinery Co., Rochester, N. Y.

14-79. **Structure Control of Gray Cast Iron.** R. G. McElwee and Tom E. Barlow. *Foundry*, v. 72, March '44, pp. 104-105, 163-164.

Choice of inoculant, amount to use, methods of adding it, and use in correcting analysis.

14-80. **Makes the Most of Floor Space.** Pat Dwyer. *Foundry*, v. 72, March '44, pp. 107-108, 179-181.

St. Louis Steel Casting Co., where monthly production of small and medium size steel castings has been raised from 175 to 550 tons.

14-81. **Factors in the Production of Quality Castings.** William G. Reichert. *Foundry*, v. 72, March, '44, pp. 114-115, 190-195.

Causes and methods of correcting internal shrinkage and sponginess in castings, and explains the effect of different gating systems on metal solidification during the freezing process.

14-82. **Casting in Plaster Molds.** Fred Chambers. *Foundry*, v. 72, March '44, pp. 98-99, 183-186.

Advantages of using plaster molds. Castings are smoother than sand castings and require less machining. Due to slower cooling of the metal, better grain growth results and better physical properties are achieved in copper and magnesium alloys. As the plaster molds and cores are soft they do not prevent shrinkage of the metal on cooling. Any restriction of this natural shrinkage sets up strains or fine cracks in the casting.

14-83. **Castings Are a Front-Line War Material.** Alex Douglas. *American Foundryman,* v. 6, March '44, pp. 9-12.

The foundry's responsibility in producing sound castings, manufactured to government specifications. Advocates the formation of a committee to serve as a "clinic" where foundrymen may feel free to present problems relating to the production of castings, and receive unbiased practical advice.

14-84. **A.F.A. Subcommittee on Sintering Test Reports.** *American Foundryman,* v. 6, March '44, pp. 2-4.

Definitions of sintering discussed, effect of time, mechanism of adhering sand in iron practice, causes of penetration, simple visual examination.

14-85. **Skin Drying Molds with Infra-red Lamps.** H. B. Voorhees. *American Foundryman,* v. 6, March '44, pp. 13-14.

The practice of skin drying molds by a simplified adaptation of infra-red lamps solved the problems of a foundry, where the quantity of orders did not justify installation of extensive drying equipment. This drying method was originally adopted as an economy measure and space saver.

14-86. **Magnesium Foundry Technique.** Ian Ross. *Foundry Trade Journal,* v. 72, Feb. 3, '44, pp. 89-92, 99.

A description of the manufacture of what is probably the largest casting made under quantity production conditions.

14-87. **Wartime Foundry Raw Materials.** *Foundry Trade Journal,* v. 72, Feb. 3, '44, pp. 97-98, 99.

How shortages are being overcome.

14-88. **Canadian Practice for the Casting of Non-Ferrous Test Bars.** *Foundry Trade Journal,* v. 72, Jan. 27, '44, pp. 78-79.

Tentative specification for non-ferrous test pieces.

14-89. **High-Duty Iron Castings.** E. Morgan. *Foundry Trade Journal,* v. 72, Jan. 27, '44, pp. 67-73.

Discussion of the new technique from various practical aspects with special reference to high-phosphorus and refined irons.

14-90. **Notes on Oil-Sand Practice in the Ordinary Foundry.** Wm. Y. Buchanan. *Foundry Trade Journal,* v. 72, Jan. 27, '44, pp. 75-76.

For certain repetition jobs stack moulding can show savings.

14-91. **Notes on Oil-Sand Practice in the Ordinary Foundry.** Wm. Y. Buchanan. *Foundry Trade Journal,* v. 72, Feb. 3, '44, pp. 93-96.

Advantages of stack moulding, followed by a warning as to oil-sand reclamation.

14-92. **Light Alloy Foundry Technique.** *Aircraft Production,* v. 6, Feb. '44, pp. 55-58.

Manufacture and use of metal patterns; cores and moulds.

14-93. **War Producer Selects "Lost Wax" Casting Process for Complicated Parts.** W. E. Ruder. *American Machinist,* v. 88, March 2, '44, pp. 94-96.

Through development of a suitable mold material and electrically controlled wax-injection machines, an old art becomes a production process for making intricate parts requiring little or no machining.

14-94. **Drop Hammer Dies Made from Cerrobend.** *Iron Age,* v. 153, March 2, '44, p. 45.

Dies for protype and sample parts are being made from Cerrobend metal cast from plaster patterns in the Detroit and Los Angeles plants of the Castoloy Corp.

14-95. **Better Copper Alloy Castings.** H. E. McGowan. *Iron Age,* v. 153, March 2, '44, pp. 50-52.

Good castings of uniform quality are the result of the combination of correct furnace construction, controlled combustion, proper sand specification and shakeout time. In this talk before the Los Angeles Chapter of the American Foundrymen's Association the author discusses the necessary controls for a copper alloy foundry.

14-96. **Continuous Casting of Metals; The Williams Process.** Edward R. Williams. *Steel,* v. 114, March 6, '44, pp. 140-141.

Advantages of this process especially in casting steel ingots include elimination of rough forming and breakdown rolling operations; practically 100% ingot yield of the metal poured; reduction in ingot surface imperfections; elimination of segregation and improvement of internal ingot quality; metallurgical control of grain size and structure by regulation of cooling speed; and reduction in invested capital per ton of metal cast and rolled.

14-97. **The Goss Process.** Norman P. Goss. *Steel,* v. 114, March 6, '44, pp. 141-142, 174-178.

Graphite serves many purposes, mold slots permit changes, casting requirements, origin of surface wrinkles, mechanism of solidification, smooth surface prevents sticking.

14-98. **Wood Dust in Moulding Sand.** *Iron & Steel,* v. 17, Feb. '44, p. 242.

Wood dust of suitable types can be used satisfactorily as a substitute (either in part or completely) for coal dust for most light and medium weight iron castings. Wood dust has been used satisfactorily in both synthetic and natural bonded sands, both as a facing and in a continuous sand system, for several months on production castings. Proportion of wood dust used. Type of wood dust. Influence on sand properties. Effect on castings.

14-99. **Phosphorus Is Serving—on Countless Fronts.** W. O. McMahon. *Pig Iron Rough Notes,* no. 96, Winter, pp. 27-30.

Value of phosphorus in gray iron castings.

14-100. **Engineered Cast Iron.** C. H. Morken. *Pig Iron Rough Notes,* no. 96, Winter, pp. 5-10.

Effect of nickel, chromium, molybdenum as alloying elements and uses of respective cast irons, chill test by sand cast step, bar method recommended. Inoculation. Effects.

14-101. **The Cupola Sand Bottom.** C. S. Whittet. *Pig Iron Rough Notes,* no. 96, Winter, pp. 13-15, 18.

Cupola preparation; refractories for sand bottoms and possibilities of failure of the latter set forth.

14-102. **A Method For Planning Foundry Production.** Ecossais. *Foundry Trade Journal,* v. 72, Feb. 10, '44, pp. 125-126.

Keeping track of orders and patterns and indicating spare capacity.

14-103. **Magnesium Foundry Technique.** Ian Ross. *Foundry Trade Journal,* v. 72, Feb. 10, '44, pp. 121-124.

Coreing up, cleaning, finishing and inspection of a large magnesium casting.

14-104. **Some Aspects of Sand Control.** F. Thomas. *Foundry Trade Journal,* v. 72, Feb. 10, '44, pp. 113-119.

Sand control in a steel foundry is a sound investment, being simple in application and giving good clean and sound castings.

14-105. **The Maintenance of Die Casting Dies.** H. K. Barton. *Machinery* (London), v. 63, Dec. 30, '43, pp. 750-752.

Systematic check on the condition of dies. System of checking, cover for wastage, office records.

14-106. **Why Die Casting?** *Die Casting,* v. 2, no. 3, March '44, pp. 36-37.

Reproducing detail, easy finishing, combining with other parts and fastening.

14-107. **Die Castings Replace Fabricated Sheet Metal Assemblies in Aircraft Work.** *Die Casting,* v. 2, no. 3, March '44, pp. 15-17.

Improved casting technique, new alloys and positive controls have made die castings, with their many important advantages over formed sheet metal structures, available for extensive use in speeding up production of war planes. The experience of one producer, the Airplane Division of Curtiss-Wright Corp. in Buffalo, is discussed.

14-108. **Founding in Aircraft Construction.** *Light Metals,* v. 7, March '44, pp. 125-126.

Abstract of, and critical commentary upon, a recent French publication reviewing foundry techniques for aluminum and magnesium.

14-109. **Test-Bars for Bronze Castings.** W. A. Baker. *Foundry Trade Journal,* v. 72, Feb. 24, '44, pp. 155-159, 163.

A plea for nationally standardized test-bars.

14-110. **Producing Sound Magnesium Castings.** J. Haywood. *Foundry Trade Journal,* v. 72, Feb. 24, '44, pp. 161-164.

Flux inclusions. Porosity and gating systems are discussed.

14-111. **Magnesium Casting Production.** *Aircraft Production,* v. 6, March '44, pp. 145-148.

Chevrolet Foundry processes for Pratt and Whitney engine components. Core-making, molds, pouring, fettling.

14-112. **Light Alloy Castings.** *Aircraft Production,* v. 6, March '44, pp. 131-136.

The light alloy foundry of Thomas Firth and John Brown, Ltd. Gravity die casting the Avro Lancaster undercarriage support beam.

14-113. **Magnesium Foundry Practice.** *Foundry Trade Journal,* v. 72, Feb. 17, '44, pp. 143-144, 146.
Helpful hints on running.

14-114. **Cupola Operation and Control.** R. C. Tucker. *Foundry Trade Journal,* v. 72, Feb. 17, '44, pp. 135-139.
Correlation between the latest theories and current practice. 9 ref.

14-115. **Cupola Operation and Control.** *Foundry Trade Journal,* v. 72, Feb. 24, '44, pp. 165-168.
The proper way to melt steel and the correct use of coke and instrument calibration are explained.

14-116. **Internal Mechanics of Cast Iron.** Gustav Meyersberg. *Iron & Steel,* v. 17, March '44, pp. 289-291.
Inherent properties in the light of German research.

14-117. **A Small Moulding Unit.** A. Wood. *Foundry Trade Journal,* v. 72, March 2, '44, pp. 175-179.
Shows the jobbing foundry the way to start mass production on sensible lines.

14-118. **Light Steel Casting Production.** *Machinery (Lloyd),* v. 16, March 4, '44, pp. 50-51.
Summary of the advantages of light steel castings as made by the special process may be helpful. There is an almost total elimination of machining losses and considerable economies are effected by reason of the truth to form of the parts, which can, therefore, be jigged.

14-119. **Steel Melting Practice.** J. Preston. *Foundry Trade Journal,* v. 72, March 9, '44, pp. 199-203.
Melting practices used in Melbourne steel castings.

14-120. **Light Alloy v. Ferrous Founding.** J. Rostron. *Foundry Trade Journal,* v. 72, March 9, '44, pp. 205-206.
Light alloy as compared with iron founding.

14-121. **The Production of Cast-Iron Pipes.** Wm. Phillips. *Foundry Trade Journal,* v. 72, March 9, '44, pp. 207-209.
Mechanical methods, restricted to mechanical molding, hand methods, Indian practice, centrifugal castings, post-war conditions.

14-122. **Centrifugal Casting Methods.** Nathan Janco. *Iron Age,* v. 153, March 30, '44, pp. 42-45.
Good centrifugal castings depend on the molds, pouring procedures and spinning speeds employed. What methods to follow and how to eliminate casting defects are discussed.

14-123. **Advanced Melting Methods.** G. A. Lillieqvist. *Metal Progress,* v. 45, April '44, pp. 666-667.
Openhearth developments; acid electric furnace operation; alloy recovery.

14-124. **High Strength, High Ductility Cast Steels.** Carl F. Joseph. *Metal Progress,* v. 45, April '44, pp. 668, 669.
Raw materials, melting practice, deoxidation, microstructure, composition, heat treatment.

14-125. **High Strength Cast Iron.** G. L. Richter. *Metal Progress* v. 45, April, '44 pp. 669-671.

Improvement in gray iron castings has been due to: Improvements in melting practices, as well as in all features of molding, especially gating and risering practice; use of processing agents and alloys; heat treatment applications.

14-126. **Centrifugal Casting.** Chas. K. Donoho. *Metal Progress,* v. 45, April '44, pp. 672-673.

Types of centrifugal casting in commercial use: Centrifuging; semi-centrifugal; true centrifugal casting, employed to produce tubular or generally cylindrical parts.

14-127. **Pressure Molded Die Castings.** David Basch. *Metal Progress,* v. 45, April '44, pp. 673-674.

Requirements for die castings in structural parts.

14-128. **Producing Copper-Zinc-Silicon Bronze Castings.** R. J. Keeley. *Foundry,* v. 72, April '44, pp. 120-121, 260, 262, 266.

Use of silicon as a substitute for tin in copper-base alloys.

14-129. **Peace, Colleges and the Making of Castings.** Clement J. Freund. *Foundry,* v. 72, April '44, pp. 122-123, 244, 246, 248, 250, 250, 252.

If the foundryman hopes to survive and prosper, he must attend to research, to education, and training after the war—and right now. 25 ref.

14-130. **Produces Magnesium Castings.** Edwin Bremer. *Foundry,* v. 72, April '44, pp. 124-125, 236, 238, 242.

Various features in production of magnesium alloy castings, principally for aircraft application. Detailed information on melting procedure as well as data on molding and core sands.

14-131. **Casting Breech Rings for Guns.** William G. Gude. *Foundry,* v. 72, April '44, pp. 126, 128, 266, 270.

Castings provide means for breaking bottlenecks in the war production program. Example of time saving efficiency given of breech ring for guns.

14-132. **Factors in the Production of Quality Castings.** William G. Reichert. *Foundry,* v. 72, April '44, pp. 130, 218, 220, 224, 226, 228.

Phases of foundry melting and pouring practice which influence quality of product.

14-133. **Structure Control of Gray Cast Iron.** R. G. McElwee and Tom E. Barlow. *Foundry,* v. 72, April '44, pp. 133, 256, 258-259.

Effects of temperature, time, and melting practice on properties of inoculated metal.

14-134. **Increasing Engineering Applications Seen in Postwar Period for Die Castings.** B. W. Hindman. *Steel,* v. 114, April 10, '44, p. 122.

Close laboratory inspection controls have bearing on progress.

14-135. **Star Performance.** John L. Kruetzkamp. *Die Casting,* v. 2, April '44, pp. 17-19.

Die castings transformed the Astro Compass from a virtually handmade instrument of high cost to one that

could be made in great numbers with mass production methods without any sacrifice in accuracy.

14-136. **Alloys for Die Casting. Part III—Copper.** *Die Casting,* v. 2, April '44, pp. 45-47.

The physical properties and compositions of the more commonly used alloys for die casting. Advantages of brass die castings are discussed in detail.

14-137. **Die Casting During and After the War.** B. W. Hindman. *Die Casting,* v. 2, April '44, East Central Section Insert.

Demand, laboratory control, post-war.

14-138. **Die Casting Copper-Zinc Base Alloys.** James L. Erickson. *Western Metals,* v. 2, April '44, pp. 8-12.

Use of Al, Fe, Mn, Pb, Sn, Si, Ni, P, Be, Sb, and Bi as alloying elements. Corrosion resistance, annealing and how to obtain desired properties. Die steels, casting temperatures. 87 ref.

14-139. **Malleable Mixture Calculation and Melting Control.** M. E. McKinney. American Foundrymen's Association Preprint No. 44-4, April '44, 13 pp.

Choice and proportion of materials in malleable mixtures has been reduced to a purely mathematical formula based on the law of averages. Operation of a powdered coal fired air furnace is controlled by a continuous indicator of exit-gas analysis, coupled with a sensitive gauge showing draft or pressure inside the furnace.

14-140. **Four-part Cheek Method of Producing Cast Iron Cylinders.** Robert Hendry. *American Foundryman,* v. 6, April '44, pp. 38-42.

The castings produced by this method are clean and pass the water test without failure. Time saved in making cylinder castings by the method outlined is so good that this job has proved to be one of the best in the shop when computed on a tons-per-hour basis.

14-141. **Heading and Gating of Malleable Iron Castings.** A. J. Klimek. *American Foundryman,* v. 6, April '44, pp. 49-51.

Methods of heading and gating that solved some problems for one foundry.

14-142. **Developing the Centrifugal Casting of Non-Ferrous Metals.** I. E. Cox. *American Foundryman,* v. 6, April '44, pp. 56-59.

A constructive review of problems relating to centrifugal casting of non-ferrous bearing metals. The research approach toward developing a mechanized method of centrifugal casting production. Designing a babbitting unit.

14-143. **American Practice for Degassing of Aluminum Alloys.** R. E. Ward. *American Foundryman,* v. 6, April '44, pp. 61, 63.

Summary of three of the most commonly used American practices for degassing aluminum alloys brings out the salient features of the double melt process, gas fluxing, and salt fluxing.

14-144. A Study of Molding Methods for Production of Sound Castings. F. G. Sefing. *American Foundryman,* v. 6, April '44, pp. 66-70.

Pouring gates should be designed so that clean metal enters the mold quietly and rapidly. Controlled directional solidification assists the freezing of the casting to begin at the coldest metal. Design and pour risers so they will assuredly feed castings by conforming to the principles of controlled directional solidification. Knock-off risers are convenient to remove and they feed adequately; chills or denseners are used where risers are impracticable, or where we wish to assist the freezing rate. Adequate venting of the mold cavity permits filling the mold easily by preventing back pressure. 6 ref.

14-145. The Mechanized Production of Aluminum Gravity Die Castings. John Vickers. American Foundrymen's Association Preprint No. 44-3, April '44, 60 pp.

Advantages of gravity die casting: Smoother finish and closer dimensional accuracy; greater possible speed of production; conservation of raw material; reduction of production scrap; and improved mechanical properties in the casting.

14-146. Centrifugal Castings. Peter Blackwood and John Perkins. American Foundrymen's Association Preprint No. 44-5, April '44, 38 pp.

The types of centrifugal castings have been briefly classified into three groups: (1) Die molds, (2) semi-centrifugal—center pour, (3) true centrifugal—cylindrical shapes, the inside diameter of which is governed by the volume of metal poured. In the foundry with which the authors are connected, they have been classified into the following groups: (1) Dry sand spinning, (2) die mold spinning, (3) green sand spinning. This paper is based on the latter types.

14-147. Heat Flow Problems in Foundry Work. Victor Paschkis. American Foundrymen's Association Preprint No. 44-6, April '44, 22 pp.

More common thermal problems encountered in foundry work. Foundation of analogy method and description of apparatus, "Heat and Mass Flow Analyzer," available at Columbia University which facilitates application of this method. Shows application of electric analogy method to specific foundry problems; that of the optimum size of the opening in the sand core between the casting and the feeding head of the casting.

14-148. Die Casting Aluminum Alloys by the Cold Chamber Process. S. U. Siena. American Foundrymen's Association Preprint No. 44-7, April '44, 8 pp.

The alloys used, details of the process and recommendations to be observed to secure the best possible product. Casting and die design and the factors involved, such as die preheating, die coatings, metal injection speeds and pressures, metal and die temperature control and melting practice. Proper inspection to secure the best possible product emphasized.

14-149. **The Melting of Non-Ferrous Metal in the Cupola.** Leighton M. Long. American Foundrymen's Association Preprint No. 44-8, April '44, 8 pp.

Design and operation of cupolas for melting pre-alloyed base alloys. Advantages of cupola melting for non-ferrous metals. 6 ref.

14-150. **Problems Encountered in Making and Heat Treating Castings of an Air Hardening Steel.** Gordon W. Johnson. American Foundrymen's Association Preprint No. 44-11, April '44, 4 pp.; also *American Foundryman*, v. 6, April '44, pp. 64-65.

Cleaning, machining, and heat treating of air-hardening steel castings which will meet the requirements of low distortion, hardening throughout, and freedom from strains and cracking.

14-151. **Brazil Produces Steel Castings to Replace Forgings and Fabricated Parts.** Henryk Zimnawoda. American Foundrymen's Association Preprint No. 44-12, April '44, 12 pp.

Castings produced to replace forged or fabricated parts. Gives methods of molding, pouring, and heat treating.

14-152. **Factors Involved in Superheating Gray Cast Iron and Their Effects on Its Structure and Properties.** A. Wm. Schneble and John Chipman. American Foundrymen's Association Preprint 44-13. April '44, 46 pp.

Data are interpreted as showing that super-heating effects are not to be attributed to destruction of residual nuclei. Results are also out of harmony with theories of nucleation by non-metallic particles. It is concluded that CO is the chief factor operating to produce the effects of superheating. It is postulated that this gas acts as a graphitizer during solidification, and that the principal effect is that of a carbide stabilizer or remover. 30 ref.

14-153. **Gating and Feeding Malleable Pipe Fittings.** Morris L. Hawkins. American Foundrymen's Association Preprint No. 44-14, April '44, 11 pp.

Foundry practices for production of sand-cast malleable iron pipe fittings. Careful selection of patterns and methods of gating, followed by a thorough inspection of trial castings. Permanent gating arrangement for patterns mounted on a single match plate illustrated by detailed drawings. The necessity for close control of molding sand, metal composition and metal temperatures for the manufacture of sound, pressure-tight malleable fittings is emphasized.

14-154. **Standards in Times of Emergency.** Phil Carroll. American Foundrymen's Association Preprint No. 44-15, April '44, 11 pp.

What is speed? Compromises injurious; essentials of progress: Manpower, training, effective timestudy methods. Timestudy simplified, rate setting deficiencies. Explaining standards, application of data methods, set-up standards, delay time, product vs. department measure, supervisory help, total effectiveness.

14-155. **Alterations in Cast Iron Properties Accompanying Use of a Strong Inoculant of the Silicon-Manganese-**

Zirconium Type. C. O. Burgess and R. W. Bishop. American Foundrymen's Association Preprint No. 44-16, April '44, 35 pp.

Essential functions of an inoculant, and the tests made to determine the suitability of silicon-manganese-zirconium inoculant employed. 8 ref.

14-156. **Introductory Observations on the Rate of Solidification of Malleable Iron.** B. C. Ywarly, R. P. Schauss and P. A. Martin. American Foundrymen's Association Preprint No. 44-19, April '44, 16 pp.

Solidification, casting design, feeders and heads, volume change and heat loss, solidification tests and rates. When the freezing rate has been accurately determined it should be possible to predict how any section of a casting may be fed.

14-157. **Some Causes of Test Bar Failures in Navy "G" and "M" Metals.** Wm. B. George. American Foundrymen's Association Preprint No. 44-23, April '44, 10 pp.

Cost of not paying attention to the casting of test bars is often expensive to the foundryman. When a test bar fails, the foundryman is unable to diagnose the trouble and prevent it from happening again. Most specifications give a liberal leeway to cover variations in test bars and allow a second bar to be pulled should the first one fail. Actual cases investigated.

14-158. **Mold Surface Properties at Elevated Temperatures.** H. W. Dietert, R. L. Doelman, and R. W. Bennett. American Foundrymen's Association Preprint No. 44-24, April '44, 19 pp.

Tests performed to obtain information concerning the elevated temperature properties of mold surfaces, such as spalling, confined expansion, hot strength, and hot deformation. Data obtained from these tests are presented graphically.

14-159. **Considerations in Casting and Coining Malleable Iron.** C. C. Lawson. American Foundrymen's Association Preprint No. 44-26, April '44, 5 pp.

The use of "coining" to produce malleable iron castings having a dimensional accuracy equal to that of machined surfaces. "Coining" refers to the application of pressure to opposite surfaces of a casting to control the dimension between the pressed surfaces.

14-160. **Better Quality Aluminum and Magnesium Castings for Aircraft.** Robert E. Ward. American Foundrymen's Association Preprint No. 44-27, April '44, 7 pp.

Necessity of producing light metal aircraft castings of the quality and in the quantity demanded by the present emergency. Close coordination of the work of designers, engineers and foundrymen is given as the fundamental essential in high quality casting production. A number of fundamental principles of casting design, with which the designing engineer should be familiar, are listed.

14-161. **The Effect of Copper on the Properties of Cast Carbon - Molybdenum Steels.** N. A. Ziegler and W. L. Meinhart. American Foundrymen's Association Preprint No. 44-28, April '44, 21 pp.

Results of studies of the effects of copper on the

physical properties of carbon-molybdenum cast steels. Data obtained from the studies are shown in graphic and tabular form. 78 ref.

14-162. **Mold Surface Back Gas Pressure.** H. W. Dietert, R. L. Doelman, and R. W. Bennett. American Foundrymen's Association Preprint No. 44-34, April '44, 17 pp.

Hot permeability measurements, gas volume increase due to temperature, hot permeability test data, gas volume measurement, gas volume data, back pressure test data, mold gas flow.

14-163. **Cupola Raw Materials.** H. W. Gillett. American Foundrymen's Association Preprint No. 44-30. April '44, 15 pp.

Coke varies and there is no unanimity how to specify it or test it for its effect on the final product; pig irons have heredity but there is no method to evaluate the differences; unpedigreed scrap or chips and turnings are so prepared as to be unsuitable for use much of the time; humidity of both pig iron and cast iron is controllable but there is no record of the value of this control. Control methods are taking some of the guesswork out of cupola practice.

14-164. **Centrifugal Casting of Steel.** C. K. Donoho. American Foundrymen's Association Preprint No. 44-32, April '44, 17 pp.

Various methods and types of centrifugal casting of steel. Advantages and disadvantages of centrifugal casting, as evaluated by comparison with static casting and forging, discussed in detail. Physical properties of steel cast centrifugally under various conditions given. The effects of various treatments on the structure and properties of centrifugally cast steel. Emphasis placed on deoxidation procedure. 8 ref.

14-165. **Spinning Speeds of Centrifugal Casting Machines.** F. G. Carrington. American Foundrymen's Association Preprint, No. 44-33, April '44, 14 pp.

Spinning speed, or revolutions per unit time, for a centrifugal mold is determined by direct effect of centrifugal force together with the force of gravity, the shape of the casting, details of machine design, and metallurgical characteristics. The fundamental differences of all these factors prevent their combined effects being determined except by experiment. Much data have been published on the spinning speeds used for castings, but to correlate such data, all the factors determining the speed must be taken into consideration. The purpose of this paper is to enumerate these factors and their individual effects.

14-166. **Reproducibility of Elevated Temperature Sand Test Results.** John A. Rassenfoss. American Foundrymen's Association Preprint No. 44-29, April '44, 22 pp.

Study to determine the accuracy with which elevated temperature compression strength results can be reproduced at a single laboratory and between different plant laboratories. Five different sand mixes were made in triplicate at a single laboratory and tested at 2500°F. The results obtained for single batches in a series deviated from the average of the three batches

made per series by 15% or less. Similar elevated temperature tests performed by four different plant laboratories on specimens from the same mixes were erratic. Furnaces were adjusted so that the maximum temperature gradient through the specimen heating zones was 21°F. and the maximum variation between the average temperatures in the specimen heating zones was 25°F. Inter-laboratory check tests made after these adjustments were much more consistent.

14-167. **Risering of Steel Castings.** John W. Juppenlatz. *Metals & Alloys,* v. 19, April '44, pp. 874-879. 5 ref.

A new practice for the manufacture of sounder steel castings with considerable reduction in waste metal known as "atmospheric pressure feeding," involves the use of blind risers and some means such as graphite rods inserted in the latter for keeping the risers open to the atmosphere during solidification. This article explains the principle involved, the use of graphite rods and demonstrates how this practice localizes the shrinkage cavity and improves the general quality of steel castings. 5 ref.

14-168. **The Hows and Whys of Centrifugal Casting.** Harold B. Zuehlike. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 733-802.

Basic engineering formulas, mold materials, measuring the quantity of metal to be poured, the condition of the metal at the time of pouring, and special procedures for casting larger type castings centrifugally. Advantages of centrifugal casting, the structures obtained in such castings, and the relative cost as compared with sand molding. 15 ref.

14-169. **A Report on the use of Aluminum in 10,000 Acid Electric Heats of Steel.** E. C. Troy. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 803-820.

Application of 0.10 to 0.15% aluminum addition to acid electric steel for castings in green sand. Melting practice and methods of adding aluminum are explained. Effects of aluminum additions on the casting properties of the steel are covered, and physical properties experienced are tabulated.

14-170. **Some Fundamental Relations Within the Cupola.** William Pennington. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 980-1055.

By a careful analysis of the factors involved in cupola melting, certain equations have been evolved by means of which the melting conditions within the cupola may be ascertained. Chemical reactions involved in the burning of fuel in a cupola. Relation of carbon gases from the fuel as a means by which the melting behavior of the cupola may be ascertained.

14-171. **Southern Bentonite in the Steel Foundry.** N. J. Dunbeck. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 929-934.

Southern bentonite, intelligently used, can be of real help to steel foundrymen in the following ways: It gives definitely higher flowability, it gives easier shake-

out, it gives greater freedom from hot cracks and tears due to sand.

14-172. **Elevated Temperature Studies of Foundry Cores and Core Making Materials.** Emile Pragoff and C. P. Albus. *American Foundrymen's Association Transactions*, v. 51, June '44, pp. 935-979.

Studies are presented on the hot strength, retained strength and expansion of two types of sand cores commonly used in foundry practice. These types are: (*a*) New sand cores, bonded with organic binders, no clay being present; (*b*) black sand cores, prepared from sands containing clay, bonded with organic binders. The conventional method of plotting hot strength curves, with data obtained at intervals of 500° F. is applied to both types of cores. The value of this method with each type core is discussed. 20 ref.

14-173. **Causes and Cures of Defects in Magnesium Sand Castings.** Roy B. McCauley and L. F. Mondolfo. *Metal Progress*, v. 45, May '44, pp. 905-910.

Lists oxide inclusions, improper flux and improper use of flux, oxide skins, blows, metallic impurities, shrinks and draws, cracks and faulty heat treatment as chief causes. Indicates ways to correct them.

14-174. **Speeding Graphitization of Malleable Iron.** C. H. Lorig. *Foundry*, v. 72, May '44, pp. 60-61, 144, 148, 150, 152, 154, 158, 160.

Coordination of foundry operations and metallurgical control is essential to shorten annealing time.

14-175. **Producing Copper-Zinc-Silicon Bronze.** R. J. Keeley. *Foundry*, v. 72, May '44, pp. 62-64, 162, 164.

Procedure followed in correcting certain casting defects. A major cause given for inability to produce sound castings from these alloys is overheating due to failure to recognize the high fluidities present at relatively low temperature.

14-176. **The Competitive Position of Gray Iron.** Donald J. Reese. *Foundry*, v. 72, May '44, pp. 65, 166, 168, 172, 174, 176.

Foundry process shortest; may have huge surplus; compare steel with plastics; consider strength-weight ratio; use more malleable; much progress made.

14-177. **Bethlehem Casts Largest Ingot Mold.** *Foundry*, v. 72, May '44, pp. 70-71, 178.

Corrugated one-piece ingot mold weighing 200 tons recently cast at the Bethlehem, Pa., plant of the Bethlehem Steel Co., is a record casting for the plant's iron foundry and probably is the largest and heaviest single piece iron ingot mold ever made.

14-178. **Produces Magnesium Castings.** Edwin Bremer. *Foundry*, v. 72, May '44, pp. 72-73, 134, 138, 140.

Procedures for making various types of magnesium castings and details on core production and sand handling.

14-179. **Around Detroit.** A. H. Allen. *Foundry*, v. 72, May '44, pp. 90, 93.

Metal penetration in steel castings is a matter of oxidation, and control over mold atmosphere will pro-

vide remedy for this problem, pinholes, scabs, etc. Addition to molding sand offers most practicable means of providing necessary reducing atmosphere.

14-180. **Metallurgy in the Non-Ferrous Foundry.** A. C. Boak. *Canadian Metals and Metallurgical Industries*, v. 7, April '44, pp. 30-32.

The metallurgist and the foundryman, metal purchases, chemical composition, fracture test.

14-181. **Titanium Bearing Graphitized Pig Iron.** *Iron Age*, v. 153, April 27, '44, pp. 47, 128.

The method for making the pig consists of charging the blast furnace with a mixture of Lake Superior hematite and some titanium bearing material such as ilmenite or rutile. In order to reduce the titanium oxide to completely dissolve Ti in the molten iron, the temperature in the combustion zone is maintained as high as possible and a larger than normal volume of basic slag is used. The process is covered by U. S. patent No. 2,298,483.

14-182. **Quality Control in High Duty Iron Production.** E. W. Harding. *Foundry Trade Journal*, v. 72, March 16, '44, pp. 219-223; March 23, '44, pp. 239-242.

Importance of ensuring constancy in casting performance.

14-183. **Some Notes and Considerations of Practical Value to Foundrymen.** F. H. Andrew. *Foundry Trade Journal*, v. 72, March 23, '44, pp. 243-245.

Book-learning must be supplemented by attentive study to practical experience.

14-184. **Rapid Methods of Analysis for Sand Control in Magnesium Foundries.** Eugene M. Cramer. *Foundry Trade Journal* v. 72, March 23, '44, pp. 247-248.

When inhibitors are present in improper quantities in magnesium foundry sands, they have a detrimental effect not only on the metal itself, but also jeopardize the production of quality castings.

14-185. **Competitive Characteristics of Centrifugal Castings.** John Putchinski. *Iron Age*, v. 153, May 4, '44, pp. 48-51.

What metals and what products can be cast centrifugally or centrifuged? What are the factors which determine the cost of manufacture centrifugally or by other methods?

14-186. **Malleabilizing with CO-CO_2.** *Iron Age*, v. 153, May 4, '44, p. 55.

Study of the reactions occurring during the decarburization of alloy and alloy-free irons with mixed CO/CO_2 atmospheres.

14-187. **Cost Factors in Die Castings vs. Sand Castings.** *Die Casting*, v. 2, May '44, pp. 25-26.

Reorders; die cost amortized.

14-188. **Alloys for Die Castings, IV, Magnesium.** *Die Casting*, v. 2, May '44, pp. 34-36.

Advantages, limitations, composition and physical properties of the alloys more commonly used for die castings. Magnesium, though one of the newer com-

merical metals, has had intensive development and holds a promising future.

14-189. **Gravity Die-Casting of Non-Ferrous Alloys.** E. H. A. Carlton. *Engineering,* v. 157, March 24, '44, pp. 237-239.

Gravity die-casting; sand casting; centrifugal casting; parts produced by hot stamping and pressing; extrusion.

14-190. **Hills-McCanna Foundry Devoted Entirely to Magnesium Castings.** Joseph Geschelin. *Automotive Industries,* v. 90, May 1, '44, pp. 30-32, 90.

Each case is treated as a research project leading to the establishment of the proper alloy, recommendations as to modifications in physical design, and development of suitable precision pattern equipment.

14-191. **Precision-Casting Process Saves Machining Operations.** *Product Engineering,* v. 15, May '44, pp. 293-298.

Old technique is revived and improved to turn out small wartime parts of intricate design demanding dimensional tolerances measured in thousandths of an inch. Further research and development may transform this casting method into a specialized field for industrial purposes.

14-192. **Magnesium Alloy Foundry Sand Control.** Oscar Blohm. *Iron Age,* v. 153, May 11, '44, pp. 74-77.

Described are the binders and inhibitors to be used and the preferable practice as regards mixing and mulling of foundry molding sand to give magnesium castings of soundness and smooth surface finish.

14-193. **The Injection of Metal Into Die Casting Dies.** H. K. Barton. *Machinery* (London), v. 64, March 30, '44, pp. 357-359.

Discussion of Frommer and Brandt's theory on flow of an ideal fluid.

14-194. **Slip Coated Synthetic Foundry Sand.** Felix Singer. *Foundry Trade Journal,* v. 72, March 30, '44, pp. 261-264.

A ceramist's views on foundry sand problems. 13 ref.

14-195. **Quality Control in High Duty Iron Production.** E. W. Harding. *Foundry Trade Journal,* v. 72, March 30, '44, pp. 265-270.

Importance of ensuring constancy in casting performance.

14-196. **Education of the Foundry Worker.** Douglas Jepson. *Foundry Trade Journal,* v. 170, March 30, '44, pp. 271-274, 276.

What can the foundry industry offer to youth?

14-197. **A Symposium on Water-Quenched Steel Castings.** C. W. Briggs. *Steel,* v. 114, May 22, '44, pp. 82-85.

Growing trend toward production and utilization of water-quenched and tempered steel castings.

14-198. **Water-Quenching Small Steel Castings.** J. W. Juppenlatz. *Steel,* v. 114, May 22, '44, pp. 84-86, 88.

Proper water quenching of steel castings is dependent upon hardenability of the steel which is a function of its analysis, the method of deoxidation used, and the

cooling rate from the proper quenching temperatures which must be compatible with the analysis and sections involved.

14-199. **Comments on Magnesium Alloy Sand Casting Practice.** L. M. Nash. *Western Metals,* v. 2 May '44, pp. 25-26, 28.

Phases in the fabrication of magnesium alloy sand castings that are the most important to their quality and appearance.

14-200. **Slip Coated Synthetic Foundry Sand.** Felix Singer. *Foundry Trade Journal,* v. 72, April 6, '44, pp. 285-288.

A ceramist's views on foundry sand problems. 9 ref.

14-201. **Design as Related to Casting Problems.** *Foundry Trade Journal,* v. 72, April 6, '44, pp. 289-293.

A call to the foundry industry to tackle the problems of casting design themselves.

14-202. **Design Features of Conveying Equipment for the Foundry Industry.** F. B. Henry and G. N. Wileman. American Society of Mechanical Engineers *Transactions,* v. 66, May '44, pp. 235-248.

General applications, with consideration given to the design of some of the more important details. Emphasis has been placed on equipment used in the handling of sand, molds, and castings, since they offer the major opportunities for economies and savings in manufacturing costs.

14-203. **The Use of Fluxes in the Melting, Refining and Casting of Magnesium-Base Alloys.** E. F. Emley. *Magnesium Review,* v. 4, Jan. '44, pp. 3-13.

Melting technique for use with magnesium alloys. Behaviour of magnesium when heated in air and the nature and purpose of the fluxes which are used.

14-204. **Preventive Measures in Respect of Run-Outs of Metal in Magnesium Foundries.** S. B. Hirst. *Magnesium Review,* v. 4, Jan. '44, pp. 14-18.

The inspection and maintenance of crucibles, the design and maintenance of furnaces, steps to be taken in the event of the occurrence of a run-out.

14-205. **The Sand Casting of a Typical Aircraft Component in a Magnesium Alloy.** G. Goddard. *Magnesium Review,* v. 4, Jan. '44, pp. 19-26.

Sand casting of an aircraft component, a short series of experiments which were carried out to eliminate a defect which was responsible for a high proportion of rejected castings in production.

14-206. **Sandslinger Moulding Practice.** W. Y. Buchanan. Institute of British Foundrymen, Advance Copy, Paper No. 795, 41st Annual Meeting, June 10, '44, 8 pp.

Moulding operations require the ramming of a quantity of sand into a space of irregular shape with the object of producing a uniform degree of ramming on all surfaces of the pattern. Methods of obtaining the desired results in moulds and cores: (a) Hand ramming; (b) jolt ramming; (c) squeeze ramming; (d) blowing; and (e) sandslinger. The last method is under consideration here.

14-207. **The Development and Production of Inoculated Cast Iron.** H. P. Hughes and W. Spenceley. Institute of British Foundrymen, Advance Copy, Paper No. 797, 41st Annual Meeting, June 10, '44, 14 pp.

Investigation and experiments which led to regular production of inoculated cast iron developed to replace ordinary cast iron, and to attempt to overcome some of the present-day problems of the iron founder.

14-208. **Steel Castings in Aircraft.** J. F. B. Jackson. *Aircraft Production,* v. 6, May '44, pp. 207-209.

Application on intrinsic merits: Special foundry technique to develop required properties.

14-209. **American Diecasting Practice.** *Aircraft Production,* v. 6, May '44, pp. 253-255.

New types of equipment and the conversion of gooseneck machines.

14-210. **Producing Magnesium Castings.** *Canadian Metals & Metallurgical Industries,* v. 7, May '44, pp. 24-27.

Technique at the Robert Mitchell Co., Ltd. Melting, sand practice, cleaning, finishing and general and X-ray inspection.

14-211. **Metallurgy in the Non-Ferrous Foundry.** A. C. Boak. *Canadian Metals & Metallurgical Industries,* v. 7, May '44, pp. 27-30.

Correct melting practice for Cu-base alloys: Avoid reducing furnace atmospheres, reducing gas producing covers or fluxes, improperly dried ladles, melting metal coated with reducing gas producing substances such as grease, oil and moisture. Melt in a furnace atmosphere containing 0.3 to 1% free oxygen. Avoid excessive oxidation losses by proper furnace design, rapid melting, proper charging and production timing.

14-212. **Causes of Porosity in Gunmetal Castings.** W. B. George. *Foundry Trade Journal,* v. 72, April 13, '44, pp. 305-310.

Saving castings and improving production through reducing the number of rejects.

14-213. **Modern Foundry Practice.** C. R. Day. *Foundry Trade Journal,* v. 72, April 13, '44, pp. 311-314, 316, 318.

International foundry industry developments.

14-214. **Development of a Flux Degassing Process for Chill-Cast Tin Bronzes.** W. T. Pell-Walpole. *Institute of Metals Journal,* v. 11, April '44, pp. 127-147.

Experiments to develop a flux degassing process for tin bronzes. The method of adding the flux, time of reaction between flux and melt, material used to thicken the flux, and minor variations in flux composition, studied. P and Al compared as deoxidants. Bronzes containing 9 to 10% Sn prepared from virgin or scrap metal, melted under the oxidizing flux, properly deoxidized, and cast so as to be free from shrinkage defects, can be extruded and subsequently cold rolled and cold drawn. Bronzes with 10 to 14% Sn can be hot or cold rolled. The wrought products have superior mechanical properties. 135 ref.

14-215. **Pours Finned Cylinders of Alloy Cast Iron.** Edwin Bremer. *Foundry,* v. 72, June '44, pp. 116-119, 260.

In compounding the sands to meet requirements imposed by the type of casting, such factors as permeability, shear, green and dry strength, flowability, etc., must be considered carefully, and varying amounts of different sands are used to meet the specific conditions.

14-216. **Oxy-acetylene Use in the Steel Foundry.** G. E. Bellew. *Foundry,* v. 72, June '44, pp. 120-122, 254.

Applications of oxy-acetylene processes in the steel foundry have provided the solution to many perplexing casting problems. Difficulties hitherto regarded as virtually unavoidable have been circumvented and large savings in time and expense have been achieved through resourceful utilization of newer methods. Introduction in most instances calls for no appreciable alteration in foundry routine.

14-217. **Melts 100 Tons of Bronze Daily.** *Foundry,* v. 72, June '44, pp. 127-129, 280, 282.

Description of plant layout.

14-218. **The Foundry Industry Looks to the Future.** *Foundry,* v. 72, June '44, pp. 123-126.

A study of wartime changes and postwar plans.

14-219. **Cupola Raw Materials.** H. W. Gillett. *Foundry,* v. 72, June '44, pp. 132, 270, 272, 274, 276, 278.

Differences between melting of steel and melting of gray iron in the cupola, effect of small amounts of elements, graphite nuclei theory, and effect of humidity.

14-220. **Increasing Gray Iron Production Through Modernization.** Edward C. Hoenicke. *Foundry,* v. 72, June '44, pp. 133, 264, 266, 268.

Methods for increasing production may be divided into two main categories: (1) Increased production resulting from better working conditions; (2) increased production because of new and better equipment and proper arrangement of present equipment.

14-221. **Around Detroit.** A. H. Allen. *Foundry,* v. 72, June '44, pp. 148, 151.

Michigan Steel Casting Co. establishes "Supercast" division for production of investment castings. Lower cost and better product compared with steel sand castings said to result from process on large runs. Automotive applications seen offering promising market prospects.

14-222. **Foundry Industry's Cooperation with Naval Research Laboratory Aids War Production.** A. H. Van Keuren. *American Foundryman,* v. 6, June '44, pp. 4-6.

Emphasizes the importance of industrial research for post-war planning and development.

14-223. **Fundamentals of Practical Sand Control.** Ralph Wertz. *American Foundryman,* v. 6, June '44, pp. 15-16.

The practical aspects of sand control, emphasizing the value of maintaining a record of sand control data and cleaning room conditions so that the results may be correlated. Production and sand control should function as a unit, with the flow from production to sand control and not from sand control to the foundry.

14-224. **Impregnation of Magnesium Castings.** H. K. DeLong. *Light Metal Age,* v. 2, May '44, pp. 10-11, 18.

The Styrene-Drying Oil Copolymer Process; the Tung Oil Process, and the Silicate Process for impregnating magnesium castings.

14-225. **Microshrinkage in Light Casting Alloys.** L. W. Eastwood. *Light Metal Age,* v. 2, May '44, pp. 12-14.

Microshrinkage in light metal casting is a defect which can be readily avoided when factors governing its formation are understood. Causes and methods of prevention.

14-226. **Utilizing the Centrifugal Casting Method.** S. D. Moxley. *Machine Design,* v. 16, June '44, pp. 131-134.

Gives favorable directional solidification; increasing the yield; exacting specifications met.

14-227. **Factors Influencing Design of Foundry Conveyors.** F. B. Henry and G. N. Wileman. *Machine Design,* v. 16, June '44, pp. 141-144.

(1) Friction parts should be entirely enclosed if possible, particularly those parts having high loads, due to the extreme abrasive nature of foundry sand and dust. (2) Points in the system where dry sand is transferred from one conveyor to another, or from conveyor to bins, should have properly designed chutes and hoods for removal of dust, steam, smoke, and gases. (3) Chutes and hoppers handling prepared or damp sand should have angles of at least 60°, rounded corners, and generous cleanout doors.

14-228. **Engineered for Machining—Part II.** John R. Ehrbar. *Die Casting,* v. 2, June '44, pp. 42-44.

A die casting cored in the upper half, or cover die, at right angles to the parting line and cored parallel with the parting line.

14-229. **A Symposium on Water-Quenched Steel Castings.** R. H. Swartz. *Steel,* v. 114, June 5, '44, pp. 104-106, 108, 164, 166, 168.

Equipment and requirements for water-quenched steel castings.

14-230. **Casting Steel Centrifugally.** S. D. Moxley. *Steel,* v. 114, June 19, '44, pp. 84-85, 148, 150, 152, 154.

Rapidly finding its place in production of high-quality engineering parts due to exceptional ability to turn out consistently sound homogeneous castings with high physical properties.

14-231. **Evolution of Test Specimen for Non-Ferrous Castings.** A. J. Smith. American Society for Testing Materials Preprint 28, June '44, 11 pp.

The integrity of certain current "standard" test specimens for cast materials has been questioned by both producers and consumers. Historical development of several prescribed specimens, especially those for cast tin bronzes and related alloys. Specimens considered are shown to be inadequate as true "measuring sticks" since they frequently lead to deceptive results, and do not find justification based on a logical development background. Design and adoption of specimens according to sound metallurgical principles is advocated.

14-232. **The Laboratory and the Foundry.** D. Fleming. *Foundry Trade Journal,* v. 72, April 27, '44, pp. 345-350, 354.

Applying science to the whole field of foundry work.

14-233. **Control in the Magnesium Foundry.** G. Dean Leach. *Foundry Trade Journal,* v. 72, April 27, '44, pp. 355-356, 358.

The main steps of the operation and some of the control methods used are considered.

14-234. **Continuous Casting.** T. W. Lippert. *Scientific American,* v. 171, July '44, pp. 19-21.

A number of relatively simple and inexpensive machines have been perfected in which molten metal is poured into one end and continuous lengths of billets, sheet, or strip emerge from the other end. Practically all aluminum, magnesium, and copper alloys can now be cast in this manner, and experiments currently under way with steel show great promise.

14-235. **Aluminum Dies for Aluminum Castings.** *Light Metals,* v. 7, May '44, pp. 213-214.

Theory and practice, design and operation of anodized-aluminum permanent molds for gravity die-casting. 2 ref.

14-236. **Founding in Aircraft Construction.** *Light Metals,* v. 7, May '44, pp. 235-236.

Suggestions for planning efficient production of castings in any aluminum alloy.

14-237. **The Laboratory and the Foundry.** D. Fleming. *Foundry Trade Journal,* v. 73, May 4, '44, pp. 7-10.

Applying science to the whole field of foundry work. Part 2.

14-238. **Centrifugal Castings.** Peter Blackwood and John Perkins. *Canadian Metals and Metallurgical Industries,* v. 7, June '44, pp. 26-33.

Outstanding developments in production; dry sand spinning; die mould spinning; green sand spinning.

14-239. **Metallurgy in the Non-Ferrous Foundry.** A. C. Boak. *Canadian Metals and Metallurgical Industries,* v. 7, June '44, pp. 34-37.

Results of oxidation.

14-240. **Shrinkage and Porosity in Light Iron Castings.** C. A. Payne. *Foundry Trade Journal,* v. 73, May 11, '44, pp. 23-29.

Bearing of variable factors of casting of metals on the occurrence of shrinkage and porosity.

14-241. **Tests Temperature Attained Within Specimens of Molding and Core Sands.** D. C. Williams. *American Foundryman,* v. 6, July '44, pp. 5-6.

Measuring elevated temperatures developed within molded sand specimens, both with and without the metal pin inserted in the center.

14-242. **Mechanical Handling in Foundries.** Institute of British Foundrymen Advance Copy 794, June 10, '44, 14 pp.

Stockyard, stockyard to melting furnaces, molten metal, moulding sand, moulds, core sand and cores, heat

treatment, fettling shop, inspection, storage and despatch.

14-243. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. Institute of British Foundrymen Advance Copy 804, June 10, '44, 18 pp.

Foundry designed to use women, development of practices and design, evolution of the new foundry, variations of new procedure, gating considerations, sand handling, dry sands before storing, sand mixing, making body cores, making small cores, core assembling, properties of alloy used, gating practice, melting department, pouring practice, control of metal, remelting practice, cleaning, heat treating department, heat treating practice, final operations.

14-244. **Defects in Magnesium Castings from Poor Heat Treatment.** Roy B. McCauley and L. F. Mondolfo. *Metal Progress*, v. 46, July '44, pp. 84-87.

Lack of solution; eutectic melting; high temperature deterioration; warpage; grain growth.

14-245. **New Gray Iron Foundry Has Interesting Features.** Edwin Bremer. *Foundry*, v. 72, July '44, pp. 70-73, 201-202, 204, 206.

Numerous features of the foundry include method of ventilation, mold shakeout, sand handling, and progressive flow from raw materials to finished casting.

14-246. **Bronze Foundry Exercises Close Control.** R. T. Covington. *Foundry*, v. 72, July '44, 76-78, 198, 200.

Layout and equipment to produce best product for war needs.

14-247. **Graphite Rods Applied to Open Risers.** Frank J. Vosburgh and Harold L. Larson. *Foundry*, v. 72, July '44, pp. 74-75, 180, 182, 184, 196.

Farrell-Cheek Steel Co. increased casting yields by applying the method of using small graphite rods in their standard open risers.

14-248. **Trends in the Foundry Industry.** Fred J. Walls. *Foundry*, v. 72, July '44, pp. 79, 208.

Engineering requirements in castings govern the trends in the foundry industry. Fundamentally, changes in these requirements, as demanded by the casting consumer, are based on the economics of obtaining certain desirable physical and mechanical characteristics.

14-249. **Dodge Aluminum Foundry Has Flexibility.** A. H. Allen. *Foundry*, v. 72, July '44, pp. 80-82, 178.

By having five separate but complete foundry units, as many as five different alloys can be cast simultaneously.

14-250. **Cupola Raw Materials.** H. W. Gillett. *Foundry*, v. 72, July '44, pp. 88, 216, 218, 220.

Tests for coke properties, briquetting of chips and borings, use of coke as a bonding agent in that process, and cupola fluxes.

14-251. **Melt Bronze in the Cupola.** Charles Gregg. *Foundry*, v. 72, July '44, pp. 89, 210, 212, 214.

By controlling and measuring the air blast, measuring the coke bed height, and amount in the charges, the melting or resulting temperature of bronze in the hearth can be controlled closely.

14-252. **Mechanical Aids to Core Production.** J. Blakiston. *Foundry Trade Journal,* v. 73, May 18, '44, pp. 43-48, 56.

Position of the foundry industry in the light of mechanical advancement during the last century. 4 ref.

14-253. **Cupola Practice.** Donald J. Reese. *Foundry Trade Journal,* v. 73, May 18, '44, pp. 49-54.

Phases of cupola practice worth checking. Any deficiencies in the standards outlined should be made good.

14-254. **Utility Briquettes from Waste Slack.** H. B. Farmer. *Foundry Trade Journal,* v. 73, May 18, '44, pp. 55-56.

Substitute for large coal in foundry processes.

14-255. **Reclaiming Foundry Sand by the Wet Method.** William Reingering and Walter Horth. *Iron Age,* v. 154, July 6, '44, pp. 68-74.

New types of sands chosen; non-critical materials used; water saving and reclaimed water cycle.

14-256. **Small Die Castings Rapidly Made.** Herbert Chase. *Metals & Alloys,* v. 19, June '44, pp. 1388-1392.

Method for making zinc alloy die castings as small as ⅛ x ⅛ in. at speeds of several hundred per min. Parts already in production include slide fastener components and other tiny articles.

14-257. **Design Rules. V.** Herbert Chase. *Die Casting,* v. 2, July '44, pp. 23-24, 63-65.

Specify the formation of holes or recesses by means of cores.

14-258. **Holding Their Own.** Edward Williams. *Die Casting,* v. 2, July '44, pp. 25-26, 28.

Undercuts are included in designs, in order to obtain necessary clearance for mechanisms.

14-259. **Laboratory Precision.** Lauren M. Burgess. *Die Casting,* v. 2, July '44, pp. 46-50.

When the quantity of parts required is so small as not to warrant the cost of a two-or-more cavity die, it is often possible for the die caster to make parts for several customers at one time in the same die casting machine.

14-260. **Graphic Cost Analyses Guide Selection of Casting Method.** *Product Engineering,* v. 15, July '44, pp. 484-488.

Effect of quantity on costs of casting various parts by different methods is shown graphically and detailed costs for producing the finished part are tabulated. By means of such analyses for various quantities of typical designs, little time is required to determine the most economical method for production of any specified quantity of a given part.

14-261. **Mechanical Aids to Core Production.** J. Blakiston. *Foundry Trade Journal,* v. 73, May 25. '44, pp. 63-68.

Position of the foundry industry in the light of mechanical advancement during the last century. 1 ref.

14-262. **Developments in the Design and Use of Side Blown Converter Plants.** P. C. Fassotte. Iron & Steel Institute, Advance Copy, June '44, 10 pp.

A shortage of hematite iron led to a re-assessment of the relative importance of the Si and C reactions in the process. The C reaction leads essentially to the formation of CO_2. The temperature increment derived from this C combustion is such that the reaction may be relied upon principally to produce the final steel temperature. Plants were built in such a way that Si could be largely dispensed with, with the concomitant elimination of hematite from the cupola charges. The operation of such a plant is discussed.

14-263. **The Effect of Grain Shape on the Moulding Properties of Synthetic Moulding Sands.** W. Davies and W. J. Rees. Iron & Steel Institute, Advance Copy, June '44, 29 pp.

In sand having comparable mechanical gradings the strength of mixtures prepared with angular sands is lower than that of the dried mould or core. These differences are attributed to the poorer packing properties of the angular sands and to differences in the grain relationships in angular and rounded sands. The distribution of bulk density in moulds and cores is analysed, and the relationship of the bulk-density gradient to the moulding properties discussed and illustrated.

14-264. **Malleable Mixture Calculation and Melting Control.** M. E. McKinney. *Canadian Metals & Metallurgical Industries,* v. 7, July '44, pp. 29-32, 44-45.

Pig iron and scrap, mixture calculation, furnace control.

14-265. **Founding in Aircraft Construction.** *Light Metals,* v. 7, June '44, pp. 274, 275.

The simplification of moulding technique and stabilizing of production methods.

14-266. **Moulding Sands and Gases in Relation to Casting Defects.** G. W. Nicholls. *Foundry Trade Journal,* v. 73, June 1, '44, pp. 85-91.

Controlling factors in the satisfactory production of iron castings. 5 ref.

14-267. **Some Principles of Melting Malleable Iron.** H. A. Schwartz. *Foundry Trade Journal,* v. 73, June 1, '44, pp. 93-95.

Principles which limit the temperature obtainable in a furnace.

14-268. **The Injection of Metal into Die Casting Dies.** H. K. Barton. *Machinery,* (London) v. 64, May 25, '44, pp. 581-583.

Typical example; behavior of standard alloys.

14-269. **Moulding Sands and Gases in Relation to Casting Defects.** G. W. Nicholls. *Foundry Trade Journal,* v. 73, June 8, '44, pp. 111-114, 116.

Controlling factors in the satisfactory production of iron castings.

14-270. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. *Foundry Trade Journal,* v. 73, July 6, '44, pp. 187-196.

Women have proved more proficient in this type of work than men.

14-271. **Die Casting Provides a Flare for Bombing.** J. R. Putnam. *Die Casting,* v. 2, August '44, pp. 22-24, 60.

Handling operations involved in the production of the die cast M-111 A2 Flare Fuse.

14-272. **Design Rules. VI.** Herbert Chase. *Die Casting,* v. 2, August '44, pp. 30, 32-34.

Slender cores may well be avoided except where the die caster agrees that their use is feasible.

14-273. **Alloys for Die Castings. V. - Tin.** *Die Casting,* v. 2, August '44, pp. 47-49.

Advantages, limitations, composition and physical properties. Tin alloy die castings indispensable in contact with food and beverage products.

14-274. **Handling Materials in Crane Steel Foundry.** Erle F. Ross. *The Foundry,* v. 72, August '44, pp. 74-77, 182, 184, 186, 188.

Capacity increased by installing additional equipment, ingenious utilization of existing floor space and overall efficiency. Bucket charging saves time; equipment eliminates labor; castings are annealed.

14-275. **Magnesium Castings by Dodge Chicago Plant.** Wm. G. Gude. *The Foundry,* v. 72, August '44, pp. 78-81, 178, 180.

Production of magnesium castings.

14-276. **Cupola Practice.** Donald J. Reese. *The Foundry,* v. 72, August '44, pp. 82, 196, 198, 200.

Reasons for using cupola melting equipment, and basic principles which must be observed for successful operation.

14-277. **It Can Be Cast Centrifugally.** John Putchinski. *The Foundry,* v. 72, August '44, pp. 84, 85, 190, 192, 194.

Factors which determine the cost of manufacture or the comparative costs as related to the process of completing a part or casting from the raw material.

14-278. **Manpower Problems in Gray Iron.** Walter I. Seelbach. *The Foundry,* v. 72, August '44, pp. 109, 112, 156, 160, 162, 164, 168.

A review of the situation and possible remedies.

14-279. **Plastic Impregnation of Magnesium Castings.** *Iron Age,* v. 154, August 10, '44, p. 63.

A new synthetic resin claims advantages over tung oil as a casting sealer or impregnant. It is 100% non-volatile compound, and has a viscosity of Y-Z on the Gardner-Holdt scale (18-23 poises).

14-280. **Desulphurisation of Cast Iron by Sodium Carbonate.** N. L. Evans. *Engineering,* v. 158, July 7, '44, p. 17.

Problems encountered.

14-281. **Ford's Centrifugal Casting Production Line.** *Machinery,* v. 50, August '44, pp. 144-151.

Development of centrifugal casting process; construction of spinning mold; advantages of centrifugal casting; centrifugal castings and forgings compared.

14-282. **Casting Rolls Royce Cylinder Blocks in Buick's $10,000,000 Aluminum Foundry.** William G. Mixer. *Machinery*, v. 50, August '44, pp. 162-169.

Description of pattern making, molding, melting, and casting practices employed.

14-283. **Foundries Prepare Castings for First Machining Operation.** John A. Macdonald. *American Machinist*, v. 88, August 17, '44, pp. 112-114.

Location bosses, provided for in original casting design, assure accuracy in first machining set-up and make possible complete inspection in foundry and in plant's receiving room.

14-284. **Mechanical Handling in Foundries. V, VI, VII.** *Foundry Trade Journal*, v. 73, July 20, '44, pp. 233-238.

The major stages in the handling of materials for the production of castings.

14-285. **Some Aspects of Technical Service Applied to the Iron Foundry.** H. Jackson. *Foundry Trade Journal*, v. 73, July 20, '44, pp. 239-240.

Liaison between producer and customer is a worthy aim.

14-286. **Spinning Speeds for Centrifugal Casting.** *Machinery* (London), v. 65, July 20, '44, pp. 71-73.

Determining the proper speed for horizontal centrifugal casting by a graph.

14-287. **Casting Alloy Steel for the Oil-Field Industry.** *Steel*, v. 115, August 21, '44, pp. 103-104, 106, 108, 154.

General picture of the more significant operations in making static castings.

14-288. **Metallurgy in the Non-Ferrous Foundry. IV. Test Bars.** A. C. Boak. *Canadian Metals and Metallurgical Industries*, v. 7, August '44, pp. 24-26, 31.

Value of test bars; factors to be controlled. 3 ref.

14-289. **Quality Control in the Foundry.** E. W. Harding. *Canadian Metals and Metallurgical Industries*, v. 7, August '44, pp. 39-40, 42, 44, 46.

Principles and experience in high duty iron production.

14-290. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. *Foundry Trade Journal*, v. 73, June 22, '44, pp. 147-151.

Women have proved more proficient in this type of work than men.

14-291. **Steel Castings — Centrifugally Cast.** James W. Moore. *Metals & Alloys*, v. 20, August '44, pp. 365-368.

The types of centrifugal castings; fields of use (especially in competition with other forms); and shapes and products for which steel castings, centrifugally cast, are especially useful.

14-292. **The Effect of Some Variations in Casting Procedure on the Properties of Degassed Chill-Cast 10% Tin Bronze.** W. T. Pell-Walpole and V. Kondic. Institute of Metals *Journal*, v. 70, June '44, pp. 275-289.

Properties of 10% tin bronze, degassed by melting under an oxidizing flux and cast into chill strip moulds, studied with respect to the effects of rate and temperature of pouring, position and number of the pouring streams, iron and copper molds, and mold temperature and dressings. The properties examined were characteristics of surface and fracture, macro- and microstructure, density, tensile and impact strength, and rolling properties. The nature and amount of porosity present under different casting conditions have a great influence on properties.

14-293. **The Injection of Metal Into Die Casting Dies.** H. K. Barton. *Machinery* (London), v. 64, June 29, '44, pp. 721-723.

As the metal is projected along the die surface, the chilling of that side of the stream which is in contact with the die intensifies the viscous shear. Local irregularities in the thickness of the initially projected skin may offer so much resistance to newly injected metal. Air penetrating beneath the initially projected skin is usually expelled by the prevailing hydraulic pressure as the cavity fills, but should the skin be soft, trapped air may coalesce to form bubbles.

14-294. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. *Foundry Trade Journal,* v. 73, June 29, '44, pp. 175-181.

Women more proficient in this type of work than men.

14-295. **Malleable Cast Iron. I.** J. A. Wylde, *Metallurgia,* v. 30, June '44, pp. 86-89.

Historical outline of the development of whiteheart and blackheart malleable castings.

14-296. **Precision Castings Employing Dental Technique by Investment Molding Process.** Robert Neiman. *American Foundryman,* v. 6, Sept. '44, pp. 5-12.

History of the process and shows how the dental technique is employed.

14-297. **Castings From the Consumers' Viewpoint.** L. A. Danse. *American Foundryman,* v. 6, Sept. '44, pp. 13-15.

Matters pertaining to inspection of castings, which will benefit both the user and producer.

14-298. **Gray Iron—Steel Plus Graphite.** James T. Mackenzie. *Foundry,* v. 72, Sept. '44, pp. 70-72.

The effect of graphite on the mechanical properties of gray cast iron.

14-299. **Foundry Metallurgy of Die Castings.** James L. Erickson. *Foundry,* v. 72, Sept. '44, pp. 73, 192, 194, 196.

Controlling factors.

14-300. **Water Quenching Large Steel Castings.** R. A. Gezelius. *Foundry,* v. 72, Sept. '44, pp. 74-77, 176, 178.

Large castings as well as smaller ones are being water quenched successfully. Equipment employed in some plants for handling castings in this process is semi-automatic in its operation.

14-301. **Cupola Practice.** Donald J. Reese. *Foundry,* v. 72, Sept. '44, pp. 79, 202, 204-206.

Weight of fuel charges, proper coke bed height, zones

in the cupola, and air supply are important factors in efficient cupola operations.

14-302. **Aluminum Castings by Dodge Chicago Plant.** William G. Gude. *Foundry,* v. 72, Sept. '44, pp. 80-83, 198, 200.

Methods used in making the finned cylinder head.

14-303. **Rapid Routine Methods for Slag Analysis.** Robert A. Willey. *Foundry,* v. 72, Sept. '44, pp. 87, 180, 182, 184.

Rapid and reasonably accurate methods for slag control. 4 ref.

14-304. **Mechanical Handling in Foundries.** *Foundry Trade Journal,* v. 73, July 13, '44, pp. 207-213.

The major stages in the handling of materials for the production of castings.

14-305. **Mechanical Handling in Foundries.** *Foundry Trade Journal,* v. 73, July 27, '44, pp. 259-261.

Major stages in the handling of materials for the production of castings. Fettling shop.

14-306. **Sandslinger Moulding Practice.** W. Y. Buchanan. *Foundry Trade Journal,* v. 73, July 27, '44, pp. 249-253.

Sandslinger as a general-purpose machine.

14-307. **Sandslinger Moulding Practice.** W. Y. Buchanan. *Foundry Trade Journal,* v. 73, August 3, '44, pp. 275-278.

Sandslinger as a general-purpose machine; feeding the Sandslinger; types of castings; savings in time.

14-308. **An Outline of Gravity Die-Casting.** M. R. Hinchcliffe. *Foundry Trade Journal,* v. 73, August 3, '44, pp. 269-273.

Survey of development in its application; improvement in mechanical properties; scope; magnesium die castings; copper-base alloys; die design; running-systems—the flow of the metal.

14-309. **Development of a Flux Degassing Process for Chill-Cast Tin Bronzes.** W. T. Pell-Walpole. *Foundry Trade Journal,* v. 73, August 17, '44, pp. 307-310, 312.

Experiments to meet the requirements for a successful oxidizing flux process.

14-310. **Steel Mixes and Inoculants in Grey Cast Iron.** W. Barnes and C. W. Hicks. *Foundry Trade Journal,* v. 73, August 17, '44, pp. 313-319.

Fixed steel content with varying amounts of inoculant; heat treatment.

14-311. **Steel Mixes and Inoculants in Grey Cast Iron.** W. Barnes and C. W. Hicks. *Foundry Trade Journal,* v. 73, August 24, '44, pp. 337-341.

Assumption that melting of steel in cupolas is a difficult practice is entirely false. Low-temperature treatment; Jominy hardenability tests; internal soundness.

14-312. **Developments in the Design and Use of Side-Blown Converter Plants.** P. C. Fassotte. *Foundry Trade Journal,* v. 73, August 24, '44, pp. 329-334.

Advantages and disadvantages of the process outlined.

14-313. **The Bonding Properties of Mixtures of Petroleum Extracts and Linseed Oil and of the Extracts Themselves.** Iron and Steel Institute Advance Copy, July '44, 19 pp.

Results obtained show that petroleum extracts, produced at refineries in Great Britain as a by-product in the purification of the lubricating-oil fraction from the distillation of crude petroleum, can be used satisfactorily to replace at least 40% of the linseed oil in core-sand mixtures. This replacement is advantageous economically, as the petroleum extracts are at present much lower in price than linseed oil, and there is the additional advantage of utilizing a home-produced by-product.

14-314. **The Influence of Centrifugal Casting (Horizontal Axis) Upon the Structure and Properties of Metals.** L. Northcott and V. Dickin. Institute of Metals *Journal*, v. 70, July '44, pp. 301-323.

Thick cylinders of three alloys—aluminium with 6% copper, 6% tin bronze, and 70:30 brass—were cast in a horizontal-axis centrifugal-casting machine, using chill molds without a central core. The casting conditions were varied in respect of mold speed, casting temperature, rate of pour, and mold temperature, and the castings were examined to determine the influence of these factors upon structure. 4 ref.

14-315. **Synthetic Sands in the Steel Foundry.** H. E. Crivan. *Metal Treatment*, v. 11, Summer '44, pp. 91-102.

Research into the merits of synthetic sands. These comparatively new products will continue to be used even when other supplies are more readily available; hot tests, effect of milling times on properties of sands; effect of ramming on physical properties of synthetic sands; semi-oil sand mixtures. 7 ref.

14-316. **Malleable Cast Iron. II.** J. A. Wylde. *Metallurgia*, v. 30, July '44, pp. 123-126, 129.

The metallurgical characteristics of both whiteheart and blackheart types, and describes production. Comparisons are made of the structures of both types in the unannealed and annealed conditions.

14-317. **The Ironfounding Industry and Co-operative Research.** Harold Hartley. *Metallurgia*, v. 30, July '44, pp. 149-151.

The variety in weight, technical complexity and application of the products of the iron foundry is enormous; developments in the last two decades have greatly increased the standard of the products. Coordinated effort. The value of cooperative research.

14-318. **Centrifugal Casting.** J. E. Hurst. *Iron and Steel*, v. 17, July '44, pp. 533-536.

Rotational speeds used commercially in centrifugal casting, both for rotation about vertical or horizontal axes or combinations of these.

14-319. **The Production of Aluminum Gravity Die Castings.** John Vickers. *Machinery* (London), v. 65, July 27, '44, pp. 105-108.

Advantages to be gained by die casting.

14-320. **Steel Castings for Aircraft.** *Aircraft Production,* v. 6, August '44, pp. 359-361.

Production of the undercarriage pivot bracket casting for the Hawker Typhoon fighter by Hadfields, Ltd.

14-321. **Industrial Precision Castings by a Manufacturing Jeweler.** J. Albin. *Iron Age,* v. 154, Sept. 7, '44, pp. 73-77.

Precision casting by the conventional "lost wax" process.

14-322. **Making Practice Bombs.** *Canadian Metals and Metallurgical Industries,* v. 7, Sept. '44, pp. 22-27.

The molding and pouring set-up, and the associated mechanized features required to produce approximately 35,000 bomb castings per week on one shift; melting, core production and sand conditioning.

14-323. **Cupola Practice.** Donald J. Reese. *Canadian Metals and Metallurgical Industries,* v. 7, Sept. '44, pp. 31-33, 44-45.

The general rules given offer a very sound guide for modification of practices that are not entirely satisfactory; lists the points where trouble may arise and the most logical steps towards correction. 6 ref.

14-324. **Quality Control in the Foundry.** E. W. Harding. *Canadian Metals and Metallurgical Industries,* v. 7, Sept. '44, pp. 37-40.

General principles and experience in high duty iron production.

14-325. **Something You Can Count On.** M. M. Hennessy. *Die Casting,* v. 2, Sept. '44, pp. 40-44.

Small quantity production made economically possible by the development of a group of master die designs. By means of interchangeable slides housings for a number of different counters are produced with minimum die costs.

14-326. **Continuous Development.** John Morse. *Die Casting,* v. 2, Sept. '44, pp. 32-35, 37.

Quantity requirements met by conversion to die castings which made mass production methods possible with a consequent marked reduction in machining time.

14-327. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 16-48.

Foundry designed to use women; development of practices and design; evolution of the new foundry; variations of new procedure; gating considerations; sand handling; dry sands before storing; sand mixing; sand preparation and properties; making body cores; making small cores; core assembling; properties of alloy used; gating practice; melting department; melting practice; pouring practice; control of metal; remelting practice; cleaning; heat treating department; heat treating practice; final operations.

14-328. **The Mechanized Production of Aluminum Gravity Die Castings.** John Vickers. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 49-112.

Advantages of gravity die casting: Smoother finish and closer dimensional accuracy; greater possible speed

of production; conservation of raw material; reduction of production scrap; improved mechanical properties in the casting.

14-329. **Factors Involved in Superheating Gray Cast Iron and Their Effects on Its Structure and Properties.** A. Wm. Schneble and John Chipman. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 113-172.

Effects of superheating on the properties of gray cast iron depend upon closely related variables which also influence the structure. Discrepancies in the literature on superheating effects are ascribed to failure to take these other factors into account. Superheating in vacuum or in dry nitrogen is substantially without effect except the indirect effect of a shift in composition. Data are interpreted as showing that superheating effects are not to be attributed to destruction of residual nuclei. Results are also out of harmony with theories of nucleation by non-metallic particles. It is concluded that the presence of carbon monoxide is the chief factor operating to produce the effects of superheating.

14-330. **Lost-Wax Art Finds Its Niche.** *Modern Industry,* v. 8, Sept. 15, '44, pp. 47, 133-134, 136, 139-140.

Precision casting is the only production forming method, applicable to all metals, that insures high accuracy and, at the same time, permits extreme intricacy of design. The only large-quantity process that can be used for tough, high-melting alloys like tool steel. The surface finish it produces is as good as that of die casting, and it's not limited in choice of materials, except for a few like tungsten carbide. Mechanical properties are good.

14-331. **The Manufacture of Converter Steel for Castings: I.** A. W. Gregg. *Industrial Heating,* v. 11, Sept. '44, pp. 1455-1456, 1458, 1460, 1462, 1464.

The details of construction and operation of the side-blow converter used in the manufacture of steel for castings, layout of typical plants designed for such manufacture, and the technical and metallurgical factors entering into the use in foundries of the blowing technique.

14-332. **Casting Iron Centrifugally.** A. E. Falk. *Western Metals,* v. 2, Sept. '44, pp. 9-12.

True centrifugal castings; pouring skill; spinning speeds; mold cooling; lengthening mold life; "fire checking"; pressure gradient.

14-333. **Cupola Raw Materials.** H. W. Gillett. American Foundrymen's Association *Transactions,* v. 52, Sept. '44, pp. 1-15.

Cupola compared with other melting furnaces; heredity fades in steel manufacture; small amounts of elements influence properties and cast iron behavior; heredity in cast iron; variations in behavior of cupola melted cast iron; the graphite nuclei theory; hydrogen and humidity as factors; behavior of coke; tests for coke properties; material scrap; small briquetting devices needed; coke as a chip-bonding agent; experi-

mental run with coke-bonded briquet; substitute briquets for pigs?; coke-bonded briquets; cupola fluxes.

14-334. **Planning Magnesium Casting.** Oscar Blohm and M. D. King. *Light Metal Age,* v. 2, Sept. '44, pp. 20-23.

Correct planning of a new production magnesium casting the difference between success and failure. Tried and proven program suggested by two well known magnesium operators.

14-335. **The Use of Leaded Gun-Metal for the Production of Castings to Withstand Pressure.** Frank Hudson. Institute of Metals *Journal,* v. 70, August '44, pp. 407-422.

Practical tests in foundries with a view to collecting data on gun-metals more suited to the production of pressure castings than the standard copper-tin-zinc alloys normally employed for this purpose. Evidence was obtained which shows that leaded gun-metal containing approximately tin 7, zinc 5, lead 5%, balance copper, with or without a nickel addition, is more adaptable to the production of pressure-tight castings of variable section than other lead-free or low-lead-content alloys. 5 ref.

14-336. **The Side Feeding of Steel Castings.** B. Gray. Iron and Steel Institute Advance Copy, July '44, 13 pp.

Rate of increase in wall thickness less on vertical than on horizontal walls, and different when the head is applied at the bottom; crystalline structures differ and two forms of solid result. Convection currents play an important part, and, in turn, are affected by the size and shape of casting. Distribution of the secondary segregated material of lower melting point has important effects in feeding. Atmospheric pressure also important. Mechanism of freezing explains why side heads are less effective with cold steel. Assessment of the efficiency of various methods of feeding when considered in the light of the experiments described. 4 ref.

14-337. **A Foundryman's Notebook.** Scribe. *Iron & Steel,* v. 17, August '44, pp. 564-565.

Fitness for purpose of patterns and cores.

14-338. **Malleable Melting.** J. H. Lansing. *Iron & Steel,* v. 17, August '44, pp. 576-580.

Consideration of operating phases in American practice.

14-339. **Automobile Castings.** *Automobile Engineer,* v. 34, August '44, pp. 315-323.

Properties and uses of Chromidium, Monikrom and Cromol for cylinder blocks and heads, crankcases and brake drums, camshafts and crankshafts. Layout and organization of the North Works foundry described.

14-340. **Steel Mixes and Inoculants in Grey Cast Iron.** W. Barnes and C. W. Hicks. *Foundry Trade Journal,* v. 73, August 10, '44, pp. 287-292.

Melting practice; cupola design; control of test-bars; increasing steel; cost of ladle addition per ton of metal.

14-341. **An Outline of Gravity Die - Casting.** M. R. Hinchcliffe. *Foundry Trade Journal,* v. 73, August 10, '44, pp. 293-297.

Survey of development in its application. Bottom

running; vertical strip runner; swan neck choke venting; feeding heads—solidification stage; equalized rate of cooling; progressive solidification; die construction; collapsible cores; loose pieces; sand cores; die wall thickness; die foundry plant; melting furnaces.

14-342. **Centrifugal Casting.** Edwin F. Cone. *Scientific American,* v. 171, Oct. '44, pp. 151-153.

Occupies prominent position in the metal industry; offers advantages of economy in metal and machining cost; forte is in the pipe and tubing fields, but can be applied to the production of shapes other than cylindrical.

14-343. **Mechanized Foundries.** *Automobile Engineer,* v. 34, July '44, pp. 271-274.

Mechanical methods and devices for handling materials.

14-344. **Cast Pistons.** *Automobile Engineer,* v. 34, July '44, pp. 279-286.

Methods and equipment employed for ingot making, core making, sand core-metal chill casting and die-casting.

14-345. **Malleable Cast Iron. III.** J. A. Wylde. *Metallurgia,* v. 30, August '44, pp. 191-195.

Important aspects of production and emphasizes the need for provision and maintenance of first-class patterns and molding equipment. Molding and core sands briefly discussed, and various melting processes summarized, especial attention directed to air- and open-hearth furnace processes. The annealing of whiteheart and blackheart malleable iron castings also briefly described.

14-346. **Steel Foundry Pouring Practice.** John Howe Hall. *Foundry,* v. 72, Oct. '44, pp. 74-75, 210, 212, 214, 216.

Advantages and disadvantages of different types of ladles used in pouring steel, methods of correcting leaks in nozzles of bottom pour ladles, and proper operating procedure in pouring.

14-347. **Patterns of Gypsum Cement.** E. H. Schleede. *Foundry,* v. 72, Oct. '44, pp. 76-77, 224, 226, 228.

Successful production of patterns from gypsum cement.

14-348. **Efficient Utilization of Compressed Air in the Foundry.** J. L. Yates. *Foundry,* v. 72, Oct. '44, pp. 80-81, 238.

Phases of efficient use of compressed air plant; size and arrangement of air piping and receiver layout; greatest utilization of compressed air devices; proper maintenance of the compressed air system; proper maintenance of the various foundry devices that use compressed air.

14-349. **Gray Iron—Steel Plus Graphite.** James T. MacKenzie. *Foundry,* v. 72, Oct. '44, pp. 86-88.

Ratios of modulus of rupture to tensile strength.

14-350. **Convert Garage Into a Foundry.** *Foundry,* v. 72, Oct. '44, pp. 90-93, 222.

Plant layout and operation.

14-351. **The Development and Production of Inoculated Cast Iron.** H. P. Hughes and W. Spenceley. *Foundry Trade Journal,* v. 73, August 31, '44, pp. 349-354.

Experiments to overcome current difficulties of the iron founder. Structure of raw materials; problem of distortion; introduction of inoculants; size and type of inoculant.

14-352. **The Injection of Metal Into Die Casting Dies.** H. K. Barton. *Machinery* (London), v. 65, August 31, '44, pp. 245-249.

Velocity during the first phase is relatively low, and the sharp increase of viscosity as the advancing metal stream contacts the cooler cavity surface tends to maintain stable conditions of flow. In the second phase, the velocity of the injected metal is higher, and it flows over an already deposited layer which, acting as a thermal insulator, effectively prevents any large increase in viscosity.

14-353. **The Development and Production of Inoculated Cast Iron.** H. P. Hughes and W. Spenceley. *Foundry Trade Journal,* v. 74, Sept. 7, '44, pp. 3-7.

Improved results shown; simpler melting practice.

14-354. **Speed of Rotation in the Centrifugal Casting Process.** J. E. Hurst. *Engineering,* v. 158, Sept. 8, '44, pp. 198-200.

The rotational speed is of first importance in its effect upon the efficiency of operation, the quality of the casting, and the design and construction of the casting machine.

14-355. **Centrifugal Casting of Steel.** S. D. Moxley. American Society of Mechanical Engineers *Transactions,* v. 66, Oct. '44, pp. 607-614.

The three methods generally used are true centrifugal casting, semi-centrifugal casting, and centrifuging. A description of each method, the work for which it is best adapted, the machines used, details of molds, and physical properties of the resulting products.

14-356. **Centrifugal Casting of Non-Ferrous Metals.** I. E. Cox. *Western Metals,* v. 2, Oct. '44, pp. 32, 35-36.

Babbitt bearing; gun bronze bearing; high lead bronze.

14-357. **First Report on the Basic Cupola by the Melting Furnaces Sub-Committee.** *Foundry Trade Journal,* v. 74, Sept. 14, '44, pp. 25-28.

Examination of results obtained in practice with basic-lined cupolas. 3 ref.

14-358. **The Development and Production of Inoculated Cast Iron.** H. P. Hughes and W. Spenceley. *Foundry Trade Journal,* v. 74, Sept. 14, '44, pp. 31-35, 30.

Underlying theories; early difficulties; influence of casting temperature.

14-359. **Casting Technique for Lead Base Babbitt Alloys.** R. G. Thompson. *Metal Progress,* v. 46, Oct. '44, pp. 739-742.

Centrifugally cast bearings; still or stationary cast bearings; bonding quality of lead babbitt; oil corrosion.

14-360. **High-Strength Centrifugal Castings.** Stanley P. Perry. *Iron Age,* v. 154, Oct. 5, '44, pp. 52-53.

Recent research resulting in centrifugally cast steels having strengths on the order of 180,000 psi., and a ductility of 10%.

14-361. **Precision Castings Employing Dental Technique by Investment Molding Process.** Robert Neiman. *American Foundryman,* v. 6, Oct. '44, pp. 7-15.

New type of centrifugal casting machine for multiple molds and compares the cost of precision castings with sand castings. 23 ref.

14-362. **As-Cast Test Bar Provided Through Investigation by A.S.T.M. for Copper-Base Alloy Castings.** *American Foundryman,* v. 6, Oct. '44, pp. 16-18.

Various test bars used for testing copper-base alloys.

14-363. **Precision for Airflow.** E. A. Rullison. *Die Casting,* v. 2, Oct. '44, pp. 38-39, 61.

It is believed that the use of zinc insures sharpness of melting point, in addition to natural fluidity, and has much to do with successful production in quantity of this casting over a period of years.

14-364. **Design Rules—VIII.** Herbert Chase. *Die Casting,* v. 2, Oct. '44, pp. 47-52.

Specify on drawing where machining is to be done; allow sufficient draft and indicate it on drawings; ejector pin marks should be indicated on the drawing if possible; many fastening devices can be integrally cast.

14-365—**Alloys for Die Casting Lead.** *Die Casting,* v. 2, Oct. '44, pp. 53-56.

Lead die castings find considerable use for certain specialized applications, particularly where corrosion resistance or high density is needed.

14-366. **Oxidation Inhibitors in Core-sand Mixtures for Magnesium Castings.** O. Jay Myers. American Institute of Mining & Metallurgical Engineers, Technical Publication No. 1776, 9 pp.

Protective agents; experiments with mixtures.

14-367. **Casting to Facilitate Machining.** T. Roberts. *Machinery* (London), v. 65, Sept. 7, '44, p. 270.

How much to allow for subsequent removal in the machine shop is a question often asked by the pattern maker when setting out new work.

14-368. **Developments in the Design and Use of Side-Blown Converter Plants.** P. C. Fassotte. *Metallurgia,* v. 30, Sept. '44, pp. 256-260.

Experiments on the relative importance of the silicon reaction; conclusions from experimental data; description and operation of the side-blown converter plant; physical properties of the steels obtained; credits and debits.

14-369. **The Side Feeding of Steel Castings.** B. Gray. *Metallurgia,* v. 30, Sept. '44, pp. 266-268.

The influence of the mechanism of freezing.

14-370. **Some Useful Wartime Developments in White-heart Malleable Iron.** G. R. Webster. *Foundry Trade Journal,* v. 74, Oct. 5, '44, pp. 87-91.

Foundry problems in the production of whiteheart malleable castings.

14-371. **Speed of Rotation in the Centrifugal Casting Process.** J. E. Hurst. *Foundry Trade Journal,* v. 74, Oct. 5, '44, pp. 95-99.
Review of conditions of rotational speed in various types of centrifugal casting processes. 13 ref.

14-372. **Metallurgy in the Non-Ferrous Foundry.** A. C. Boak. *Canadian Metals and Metallurgical Industries,* v. 7, Oct. '44, pp. 28-31.
Some fundamentals for successful castings. 3 ref.

14-373. **Equipment and Material for Precision Casting.** J. Albin. *Iron Age,* v. 154, Nov. 9, '44, pp. 52-58.
Products offered by manufacturers that have typical uses in precision casting by the "lost wax" process. Unpublished data on details of the technique.

14-374. **Speed of Rotation in the Centrifugal Casting Process.** J. E. Hurst. *Foundry Trade Journal,* v. 74, Oct. 12, '44, pp. 117-120.
Review of conditions of rotational speed in various types of centrifugal casting processes. 22 ref.

14-375. **Bench Coremaking Time Standards for Job Shops.** William A. Grede. *Foundry,* v. 72, Nov. '44, pp. 80, 208, 210.
Standards for bench coremaking set-up using time without fatigue allowances.

14-376. **Modern Foundry Architecture.** Mary Munro Smith. *Foundry,* v. 72, Nov. '44, pp. 86-87, 212, 214, 216.
Cast armor plant operated by the American Steel Foundries at East Chicago.

14-377. **Determination of Sprue Size in Aluminum Castings.** Cornelius Benkoe. *Foundry,* v. 72, Nov. '44, pp. 88, 184.
Chart for determining the correct size of downsprue.

14-378. **Chilled Iron Produced by Tellurium.** John S. Crout. *Foundry,* v. 72, Nov. '44, pp. 89, 218, 220.
Methods, difficulties, advantages, and uses. 2 ref.

14-379. **Patterns of Gypsum Cement.** E. H. Schleede. *Foundry,* v. 72, Nov. '44, pp. 90-91, 186, 188, 192, 196.
Methods of forming patterns of various shapes.

14-380. **Equipment and Material for Precision Casting.** J. Albin. *Iron Age,* v. 154, Nov. 16, '44, pp. 53-59.
Induction heating furnaces and centrifugal casting machines.

14-381. **Dry Foundry Ladles Through Eliminating Boiling Produce More Salable Castings.** C. E. Bales and F. McCarthy. *American Foundryman,* v. 6, Nov. '44, pp. 2-5.
Boiling in ladles, due to damp linings, is dangerous and detrimental to iron and steel. Emphasizes that ladles should be preheated to drive out the chemically combined water in refractory linings, and describes various methods of drying and preheating ladle linings.

14-382. **Some Useful Wartime Developments in Whiteheart Malleable Iron.** G. R. Webster. *Foundry Trade Journal,* v. 74, Oct. 19, '44, pp. 139-142.

Foundry problems in the production of whiteheart malleable castings.

14-383. **The Production of Gray Iron Castings in Metal Molds.** C. Englisch. *Die Giesserei,* v. 30, no. 16/17, August '46, pp. 181-189. *Engineers' Digest,* v. 1, Oct. '44, pp. 622-624.

The use of stationary molds.

14-384. **The Production of Aluminium Gravity Die Castings.** John Vickers. *Machinery* (London), v. 65, Oct. 26, '44, pp. 469-472.

Melting plant; duplexing system adopted; chalk test.

14-385. **Influence of Melting Conditions on Steel Castings.** H. T. Protheroe. *Engineering,* v. 158, Nov. 3, '44, pp. 358-360.

Factors which during the various steps in the production of a steel casting, had the most decided influence on the mechanical properties of the final product.

14-386. **The Mechanized Production of Aluminum Gravity Die-Castings for the Merlin Engine.** John Vickers. *Foundry Trade Journal,* v. 74, Nov. 9, '44, pp. 193-199.

Advantages of gravity die casting over sand casting.

14-387. **The Side Feeding of Steel Castings.** B. Gray. *Foundry Trade Journal,* v. 74, Nov. 9, '44, pp. 201-204.

A note on the influence of the mechanism of freezing. 4 ref.

14-388. **Centrifugal Casting of Aircraft Engine Cylinder Liners.** *Machinery* (London), v. 65, Nov. 9, '44, pp. 505-511.

Development of process; construction of spinning mold.

14-389. **Unique Centrifugal Steel Casting Method.** Gerald E. Stedman. *Metals and Alloys,* v. 20, Nov. '44, pp. 1311-1315.

Technique for centrifugally casting steel sheaves and other parts described, is one of the fastest yet developed and should be of wide interest to foundry engineers.

14-390. **What Will Decide Postwar Buying of Castings?** R. V. Elms. *Aluminum and Magnesium,* v. 1, Nov. '44, pp. 16-17, 32.

Foundry must be prepared to take full advantage of technical improvements and adequate inspection to insure that quality control is effective.

14-391. **Magnesium Castings for High Pressure Service.** W. O. Wetmore and T. W. F. Foster. *Aluminum and Magnesium,* v. 1, Nov. '44, pp. 18-19, 43.

Purpose of tests reported was to prove that magnesium castings free of any porosity are capable of withstanding relatively high internal hydraulic pressures.

14-392. **The Development and Production of Inoculated Cast Iron.** H. P. Hughes and W. Spenceley. *Engineering,* v. 158, Nov. 10, '44, pp. 378-380.

Production of inoculated cast iron, developed to replace ordinary cast iron.

14-393. **Metallurgy in the Non-Ferrous Foundry.** A. C. Boak. *Canadian Metals and Metallurgical Industries,* v. 7, Nov. '44, pp. 31-33.

Gates and risers; bottom gating; pouring temperatures; hottest metal in riser; top pouring of castings; sand wash; modified bottom pouring; application of top pouring; horizontal casting.

14-394. **Quality Control in the Aluminum Foundry.** Roland T. Kinney. *Western Metals,* v. 2, Nov. '44, pp. 32, 37-38.

Yield strength is undoubtedly more important than tensile strength, and parts should be designed to stay below the stress where permanent deformation begins.

14-395. **Postwar Aluminum Castings.** Frank E. Gaines. *Western Metals,* v. 2, Nov. '44, pp. 58, 61.

Factors in favor of building up an aluminum casting market.

14-396. **Gravity Die Casting of Aluminum Alloys.** A. Vath. *Light Metal Age,* v. 2, Nov. '44, pp. 14-19.

Nature of gravity die-casting, conditions for its application, and design of castings. The design of molds; the properties of various alloys, as well as choice of alloys.

14-397. **Future Outlook in the Aluminum Foundry Industry.** E. Carrington. *Light Metals,* v. 7, Nov. '44, pp. 515-518.

Effect of wartime technical developments on the postwar consumer field for aluminum castings. Aspects of the secondary metal market examined; possible new fields of use suggested.

14-398. **Founding of Magnesium Alloys.** *Light Metals,* v. 7, Nov. '44, pp. 560-562.

Casting of the ultra-light alloys. Importance of a fundamental knowledge of magnesium chemistry and physics is emphasized.

14-399. **Redesigning a Foundry for Maximum Efficiency.** R. W. Bierwagen. *Foundry,* v. 72, Dec. '44, pp. 74-78, 106.

Produce straight line flow of the materials going into the founding of castings. Provide mass production facilities adaptable to jobbing orders. Provide necessary control facilities for maintaining a uniform product and a reduction in defective castings.

14-400. **Selecting Inhibitors for Magnesium Molding Sand.** L. W. Eastwood. *Foundry,* v. 72, Dec. '44, pp. 82-83, 232, 234.

Various types of reactions which occur when molten magnesium enters a sand mold, and methods of correcting them, are discussed in this first of two articles.

14-401. **Plant Layout for High Frequency Melting.** George F. Applegate. *Foundry,* v. 72, Dec. '44, pp. 84-86, 202, 204, 206.

By combining up-to-date material handling techniques, plant layout, and high frequency melting, numerous modern alloy steel and non-ferrous metal foundries are achieving cleanliness, comfort, and smooth-flowing production of uniform, clean, precise-composition castings with low metal loss.

14-402. **Patterns for Magnesium Castings.** Harry J. Jacobson. *Foundry,* v. 72, Dec. '44, pp. 87, 192, 196.

Basic factor in successful production of quality magnesium castings is the pattern.

14-403. **Improvements in Pressure Ferrous Castings Influencing Their Future Use.** E. C. Jeter. *American Foundryman,* v. 6, Dec. '44, pp. 5-10.

Development and improvements in the centrifugal casting field. History of the process and discusses current applications to offer clues to the future trend of centrifugally cast parts. 6 ref.

14-404. **Foundation of Sand Rammer.** *American Foundryman,* v. 6, Dec. '44, pp. 11-16.

Various methods of supporting the A.F.A. standard sand rammer were examined to find their effects on sand strength and permeability. Shock absorbing supports were unsatisfactory. Several acceptable methods described.

14-405. **Centrifugal Castings.** Peter Blackwood and John Perkins. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 273-312.

Types of centrifugal castings classified into three groups: (1) Die molds, (2) Semi-centrifugal—center pour, (3) True centrifugal — cylindrical shapes, the inside diameter of which is governed by the volume of metal poured. The authors have classified them into following groups: (1) Dry sand spinning, (2) Die mold spinning, (3) Green sand spinning.

14-406. **Centrifugal Casting of Steel.** C. K. Donoho. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 313-332.

Various methods and types of centrifugal casting of steel. Advantages and disadvantages of centrifugal casting, as evaluated by comparison with static casting and forging. Physical properties of steel cast centrifugally under various treatments and the structure and properties of centrifugally cast steel discussed. 8 ref.

14-407. **Precision Casting by the Investment Molding Process.** Robert Neiman. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 349-383.

Shows how precision casting process by the investment method fills a need for producing accurate castings of an intricate nature. Historical basis given briefly and developed more fully in its dental use which serves as the basis for the precision casting. Physical principles of compensating shrinkages and expansions with the properties of pattern materials, investments, and casting alloys. Information given for producing precision castings from the blueprint stage to the final inspection and gaging. 23 ref.

14-408. **Design and Safe Operation of Centrifugal Casting Machines.** James G. Weber. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 384-392.

Inherent problems and dangers connected with the process, as well as the wide divergence from the field of static casting.

14-409. **Centrifugal Casting of Non-Ferrous Metals.** I. E. Cox. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 407-413.

Research approach toward developing a mechanized method of centrifugal casting production.

14-410. **Spinning Speeds of Centrifugal Casting Machines.** F. G. Carrington. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 333-348.

Spinning speed, or revolutions per unit time, for a centrifugal mold determined by direct effect of centrifugal force together with the force of gravity, the shape of the casting, details of machine design, and metallurgical characteristics. Paper enumerates these factors and their individual effects.

14-411. **Some Practical and Economic Aspects of Small Foundry Conveyorization.** Howard B. Nye. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 414-420.

When foundry improvements should be made to promote greater efficiency and/or higher production, conveyors are among the first additions suggested. Most frequently posed questions with regard to foundry mechanization.

14-412. **Mold Surface Properties at Elevated Temperatures.** H. W. Dietert, R. L. Doelman, and R. W. Bennett. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 421-440.

Tests to obtain information concerning the elevated temperature properties of mold surfaces, such as spalling, confined expansion, hot strength, and hot deformation. Data presented graphically.

14-413. **Malleable Mixture Calculation and Melting Control.** M. E. McKinney. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 441-458.

The choice and proportion of materials in malleable mixtures reduced to a mathematical formula; operation of a powdered coal fired air furnace is controlled by a continuous indicator of exit-gas analysis, coupled with a sensitive gage showing draft or pressure inside the furnace.

14-414. **Introductory Observations on the Rate of Solidification of Malleable Iron.** B. C. Yearley, R. P. Schauss and P. A. Martin. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 483-500.

Experiments to determine the freezing rate of malleable iron. When the freezing rate has been accurately determined, it should be possible to predict how any section of a casting may be fed.

14-415. **The Four-Part Cheek Method of Producing Cast Iron Cylinders.** Robert Hendry. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 517-526.

Manufacturing paper machinery in a pre-war era, converted to building marine steam engines, a method of production, combining speed with efficiency, had to be adopted—the 4-part cheek method.

14-416. **Die Casting Aluminum Alloys by the Cold Chamber Process.** S. U. Siena. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 543-551.

Alloys used, details of the process and recommendations to be observed to secure the best possible product.

Casting and die design and the factors involved in the process, such as die preheating, die coatings, metal injection speeds and pressures, metal and die temperature control and melting practice.

14-417. **The Mechanized Production of Aluminum Gravity Die-Castings for the Merlin Engine.** John Vickers. *Foundry Trade Journal,* v. 74, Nov. 16, '44, pp. 215-220.

Advantages of gravity die-castings over sand castings.

14-418. **Magnesium Casting Alloys.** *Machine Design,* v. 16, Dec. '44, pp. 169-174.

Properties, characteristics, applications, fabrication, resistance to corrosion, galvanic corrosion.

14-419. **Carbon and Graphite Mold Plugs and Stool Inserts.** V. N. Nolan. *Steel,* v. 115, Dec. 25, '44, pp. 94, 96, 120.

Carbon stool allows metal in mold to retain fluidity for sufficient period for gases to be liberated and thus prevent destruction of stool. Carbon and graphite, because of their physical properties, lend themselves to various metallurgical processes including the production of low and high carbon steels, copper and brass, tungsten carbide tools and cobalt-chromium-tungsten alloys. Carbon mold plugs first used in electric furnace shops for this purpose.

14-420. **The Influence of Centrifugal Casting Upon the Structure and Properties of Steel.** L. Northcott and D. McLean. Iron and Steel Institute, Advance Copy, Nov. '44, 14 pp.

Thick cylinders of a nickel-chromium-molybdenum steel were cast by the centrifugal process using chill molds rotating about a horizontal axis without a central core. The casting conditions were varied with respect to mold speed, casting temperature and rate of pouring, and each casting was examined to determine the influence of these factors upon its structure. Mode of solidification of castings showing the different structures is discussed. 5 ref.

14-421. **Progress in the Method of Pressure Casting and in the Composition of Alloys Adaptable for Such Castings.** E. Lohrke. *Metall-Wirtschaft,* nos. 27-29, August 20, '43, pp. 401-405.

The years of the war have impelled rationalization and mass production in the industry. Pressure casting was one of the methods highly developed in these years. Machines and dies used, composition of alloys adaptable to such methods of casting, and the surface protection of finished castings are described.

14-422. **Patterns and Pattern Equipment.** *Canadian Metals & Metallurgical Industries,* v. 7, Dec. '44, pp. 37-38.

Place of patterns and allied equipment in foundry efficiency, cost and suitability of design for the purpose intended. General types and markings.

SECTION XV

SECONDARY METALS; SALVAGE

15-1. **Winning the War with Scrap.** *Aviation,* v. 43, no. 1, Jan. '44, pp. 184-185.

Everything except dust on the floors is saved by NAA's Texas Division. Dividend paying salvage program.

15-2. **Length of War in Europe Will Probably Affect Supply of Scrap.** Edwin C. Barringer. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 65-67.

Figures on consumption of iron and steel scrap to show probable effect of length of war on available supply.

15-3. **The Navy's Salvage Program.** F. Lowell Lawrance, *Mining and Metallurgy,* v. 25, no. 445, Jan. '44, pp. 12-13.

Various kinds of scrap segregated and re-used, or sold by sealed bids or auction.

15-4. **Magnetic Separation of Non-Ferrous Scrap.** H. H. Thompson. *Metal Industry,* v. 63, Dec. 31, '43, pp. 418-419.

Types of machines in use: Pulley, drum, chute-type, magnet chute. Removal of iron from sand.

15-5. **Secondary Aluminium in War Production.** J. J. Bowman. *Metal Industry,* v. 63, Dec. 31, '43, pp. 420-421.

Segregation of plant scrap; peacetime and present-day scrap; use for secondary metal; alloys suited to use of secondary metal.

15-6. **Brass Cartridge Scrap.** *Chemical Age,* v. 50, Jan. 1, '44, pp. 15-16.

Re-use for cartridges, the "certified ingot" plan.

15-7. **Practical Methods of Segregating Steel Swarf.** *Engineers' Digest,* v. 1, Feb. '44, pp. 148-149.

Organization, identifying the material, marking the machine, clearing the machine, crushing the swarf, reclaiming the oil from the swarf.

15-8. **Utilizing Alloy Steel Scrap.** Victor E. Zang. *Foundry,* v. 72, March '44, pp. 113, 134.

Ferrous Industry Advisory Committee of the War Production Board recently received this report of a series of tests run by one foundry in an effort to increase the use of alloy steel scrap.

15-9. **Brass Cartridge Scrap.** *Chemical Age,* v. 50, Jan. 1, '44, pp. 15-16.

An aid in copper conservation.

15-10. **Chip-Disposal Methods.** Frank J. Oliver. *Mechanical Engineering*, v. 66, March '44, pp. 163-168.

Scrap segregation, material handling, crushing the turnings, making briquettes, European methods of salvage.

15-11. **Non-Ferrous Secondary Metals.** F. H. Wright. *Mining Congress Journal*, v. 30, Feb. '44, pp. 92-93.

Non-ferrous metals supply sustained by all-out salvage drive.

15-12. **Iron and Steel Scrap.** Harold E. Carmony and L. Cullen. *Mining Congress Journal*, v. 30, Feb. '44, pp. 93-94.

Iron and steel scrap industry duplicates previous record performance.

15-13. **How to Smelt Battery-Plate Scrap.** Carle R. Hayward. *Engineering & Mining Journal*, v. 145, March '44, pp. 80-83.

Methods used; softening; flux ration, and reduction; furnace corrosion.

15-14. **Secondary Aluminum in War.** R. J. Priestman. *Metallurgia*, v. 29, Feb. '44, pp. 197-199.

The recovery of scrap and wastes, and their use with, or instead of, metals produced from ores, is sound economics, and entirely in accord with the general principle of conserving natural resources. This is true of aluminum scrap, as of other forms of scrap, from which secondary aluminum is produced, and which has contributed to the expanding aluminum requirements imposed by war. The author outlines the production of this important source of supply and stresses the control facilities by which the standard is maintained.

15-15. **Many Problems Still Confront Scrap Metal Dealers Under the Price Control Program.** Karl L. Anderson. *Metals*, v. 14, March '44, pp. 10-11, 13.

Ingot makers seen placed in marginal position because of raw material shrinkage; copper scrap scarcity serious.

15-16. **Volume of Secondary, Scrap Metals Since the Start of War Shows Striking Increase.** Thomas H. Miller. *Metals*, v. 14, March '44, pp. 14-15, 20.

Greatly increased volume of old scrap that will be an inevitable aftermath of the war suggests a greatly expanded secondary metals industry, and presents major problems in preparation and refining of contaminated scrap and in the development of new markets to absorb the increased output.

15-17. **The Effect of Chrome Oxide in Basic Open Hearth Slags.** C. R. Funk. *Blast Furnace & Steel Plant*, v. 32, April '44, pp. 448-454.

Greater percentages of chrome contaminated scrap can be used than heretofore thought possible, but to do so a more definite control of charging, melting, and furnace practice must be developed than is now being used in the majority of shops. A thorough knowledge of the slag is very essential both chemically and mineralogically. A thin section prepared from the type slags will soon show the characteristics of such slags, and with these data correlated to the floor samples a

definite approach can be made to a more practical and useful furnace practice.

15-18. **Down-Grading of Aluminum Casting Alloys.** *Metal Progress*, v. 45, May '44, pp. 892-893.

Approximate equivalent specifications for aluminum casting alloys and substitution chart.

15-19. **Reclamation of Non-Ferrous Scrap Metals and Alloys on the South African Railways.** A. B. Sidey. *Foundry Trade Journal*, v. 72, March 23, '44, pp. 249-250.

South African experiments in the re-use of white metal.

15-20. **War Plant From Scrap Pile.** *Mining World*, v. 6, April, '44, pp. 14-16.

How the U. S. Vanadium Corp., acting for Metals Reserve Co., converted an old smelter into an efficient vanadium plant that with new materials would have cost a million dollars and taken many months longer.

15-21. **Recovery of Waste Finish Materials.** Herbert H. Watjen. *Industrial Finishing*, v. 20, May '44, pp. 64, 66.

General outline of some of the techniques that can be used to minimize the waste of finishes.

15-22. **Battlefield Scrap.** *Western Metals*, v. 2, May '44, pp. 33-34.

Policies have been determined for the full utilization of all salvage—both repairable property and scrap—plus any surplus army material, by seeing that it is channeled back into fields where needed.

15-23. **Conservation and Reclamation of Material for Maintenance of Way.** R. P. Winton. *American Railway Engineering Association Bulletin*, v. 46, June-July '44, pp. 1-36.

Tolerances for reclamation; gages important; Mn and rail-bound Mn frogs; procedure; switch stands; flame cleaning and oiling rails and joint bars.

15-24. **Reclamation of Automotive Valves.** Norman Hoertz. *SAE Journal*, v. 52, Sept. '44, pp. 430-435.

Ways and means of repairing valves.

15-25. **Briquetting "Swarf" at Warner and Swasey.** G. W. Birdsall. *Steel*, v. 115, Sept. 18, '44, pp. 112-114, 178, 180.

All types of machine cuttings are returned to use by effective system. Briquettes of cast iron "borings" are used by plant foundry. Steel and other metals briquetted when market warrants.

15-26. **Routine Inspection and Salvage of Machinery Weldments.** James W. Owens. American Welding Society Preprint, Oct. '44.

Inspection and salvage of "Customer Inspected" and "Non-Customer Inspected" weldments in an organization having shops for the machining of weldments fabricated in its own welderies and by its own subcontracters.

15-27. **Magnetic Separation.** John E. Hyler. *Steel*, v. 115, Sept. 25, '44, pp. 95-96, 134.

Principles applied to many industrial processes, from segregation of scrap to removal of metal particles from oil lines.

15-28. **Aluminum Scrap and Secondary Metal.** Alexander Korn. *Chemical Age*, v. 51, Sept. 2, '44, pp. 233-234.

Output of secondary ingot; post-war market; need for research.

15-29. **Routine Inspection and Salvage of Machinery Weldments.** James W. Owens. *Welding Journal*, v. 23, Oct. '44, pp. 891-905.

A contrast of design, inspection and salvage requirements and procedures; inspection techniques and procedures; salvage techniques and procedures.

15-30. **Use of Secondary Magnesium.** W. E. Martin. *Aluminum & Magnesium*, v. 1, Oct. '44, pp. 34-35.

Reclamation of magnesium scrap.

15-31. **Routine Inspection and Salvage of Defective Machinery Weldments.** James W. Owens. *Steel*, v. 115, Nov. 13, pp. 113-114, 116, 118, 120.

Important economic advantages are to be obtained from systematic inspection of parts and application of proven salvage procedures for reclaiming rejected work.

15-32. **Centralized Chip and Oil Salvage Pays Substantial Dividends.** Crawford Campbell. *American Machinist*, v. 88, Nov. 23, '44, pp. 94-97.

Treating chip cleaning and reclamation of oils and solvents as bulk-material handling operations. Operating at less than capacity, the chip house built by a Canadian arms manufacturer will pay for itself in two years, besides helping the shop to obtain better product quality.

15-33. **Reclamation of Tin from Tin Cans.** Walton S. Smith. *Metals*, v. 15, Nov. '44, pp. 14-15, 17.

Domestic source; difficulties involved; detinning capacity; steel scrap recovered.

15-34. **Salvaging of Large Cast Iron Castings.** H. O. Quartz. *Iron Age*, v. 154, Nov. 30, '44, pp. 52-56.

Defective castings weighing up to a few hundred pounds are often more economically scrapped than repaired, particularly if they are being turned out in large quantities. Castings weighing up to 100 tons and taking weeks to mold and pour, however, cannot be so readily thrown away if defects appear. With the customer's approval, one of several methods can be employed to salvage many of these large castings. Arc and gas welding as well as "burning" are illustrated.

15-35. **The Utilization of Fired Cartridge Brass in Cast Manganese Bronze.** John T. Robertson. American Foundrymen's Association *Transactions*, v. 52, Dec. '44, pp. 527-538.

Fired cartridge brass can be used in the manufacture of low tensile cast manganese bronze with no serious harm to the mechanical properties provided that the antimony content is not more than 0.01%. 5 ref.

15-36. **Baling Sheet Scrap.** G. W. Birdsall. *Steel*, v. 115, Dec. 18, '44, pp. 92-93, 142, 144, 146, 148.

Value of skeleton material from stamping operations is increased by $4 to $6 per ton when loose material is hydraulically compressed into bundles. Any stamp-

ing department with more than 5 tons per day of such material can profitably employ hydraulic baling, it is reported. Large baling installations are used by many steel mills to handle their own mill trimmings and sheet scrap.

SECTION XVI

FURNACES AND FUELS

16-1. **Heat Generating Pads.** *Metal Industry,* v. 63, no. 21, Nov. 19, '43, pp. 329-330.

Ways in which heat generating pads of the types described may find useful application in industry, since with them a controlled temperature-time cycle can be obtained without the use of mechanical connections.

16-2. **Fixtures Boost Pit Furnace Capacity.** Joseph Sammon. *American Machinist,* v. 88, no. 1, Jan. 6, '44, pp. 88-90.

Maximum efficiency is realized from pit-type furnaces when the work supporting means is designed with an eye upon the nature of the parts, the heat-treating process and the quality standards involved.

16-3. **Developing an Induction Heating Machine.** William Tuerck, Jr. *Machine Design,* v. 16, no. 1, Jan. '44, pp. 137-139, 194.

Spark-gap high-frequency induction oscillator, design and operation: types of gaps, brazing of disks.

16-4. **Bright Annealing of Steel Strip in Electrically Heated Bell-Type Furnace in Russian Steel Mill. V. A.** Sochinski and V. P. Gryaznov. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 58-59.

Description of PSK-210 furnace.

16-5. **Anthracite Pig Iron.** R. H. Sweetser. *Iron Age,* v. 152, no. 27, Dec. 30, '43, pp. 32-39.

History of anthracite as a metallurgical fuel.

16-6. **Steel Mill Boiler Units Use Supplementary Fuels.** M. H. Kuhner. *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 62-64, 66.

Quick-cleaning burners for blast furnace gas, and a recently designed unit for handling 4 types of fuel either independently or in combination. Summary of the successful performance of steel mill boilers fired with blast furnace gas.

16-7. **Steel Mill Boiler Units Use Supplementary Fuels.** M. H. Kuhner. *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 96-100, 123.

High-capacity steam generating plants firing blast furnace gas in combination with pulverized coal are designed with low rate of heat release. Super-heater performance affected by mass gas flow. Correct fuel-air ratio and combustion control.

16-8. **Steam Generation in Steel Plants.** F. X. Gilg. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 128-133, 158.

Various designs for boilers for use in steel mills showing modern improvements in boiler circulation, feed-water treatment and fuel and furnace requirements for reliable steam generation.

16-9. **Electric Furnace Practice.** W. J. Reagan. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 89-93.

Method of electric furnace steel production with discussion of the charge, and melting down, and finishing slag. Tables and charts.

16-10. **The Expansion Program and the Future of the New Blast-Furnaces.** Wm. A. Haven. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 113, 158.

Post war use of the new blast furnaces.

16-11. **The Dimensions and Rating of the Blast Furnace.** Owen R. Rice. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 114-118.

Method for measuring and rating a blast furnace.

16-12. **Effect of Good and Bad Coke on Blast Furnace Operation.** Charles J. Rice. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 101-103.

Types of coke and the results of their use in blast furnaces.

16-13. **Selection of Electric Furnace Types.** Victor Paschkis. *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 52, 54, 56, 58, 60.

Considerations in selection of a type of electric furnace and relative merits of each type.

16-14. **New Electric Furnace Steel Making Plant Has 160,000 Tons Capacity.** *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 70, 72, 74, 76.

Plant layout, furnace design. Flow of materials through the plant, making a typical heat, tapping a heat, ladle design, teeming practice and production scheduling and control.

16-15. **Emergency Conversion of Industrial Furnaces from Gas or Oil to Coal.** W. Trinks. *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 46, 48, 50.

Factors involved in reverting to use of coal, burned on a grate, as fuel for heating furnaces.

16-16. **Colloidal Oil as a War and Post-War Fuel.** J. G. Coutant. *Iron & Steel Engineer,* v. 21, no. 1, Jan. '44, pp. 58-64.

A mixture of 40% pulverized coal, 60% fuel oil is advocated by the author as a means of reducing oil consumption. No change in equipment for handling and burning is said to be necessary.

16-17. **Progress in Supplying Power to Arc Furnaces.** C. C. Levy. *Iron & Steel Engineer,* v. 21, no. 1, Jan. '44, pp. 36-42.

Furnace design and skillful operation have combined with progress in electrical equipment and power supply to give electric arc furnaces an excellent production record.

16-18. **The History of the Small Steelmaking Converter.** E. C. Pigott. *Engineering,* v. 71, no. 4067, Dec. 24, '43, p. 515.

Development of converter from 1856-1896. (Part I).

16-19. **Reclaiming Sulphur From Coke Oven Gas.** *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 143, 179.

Purification of coke oven gas has been started by the Ford Motor Co., Dearborn, Mich., a sulphur plant now in operation extracting approximately 6 tons of 99% pure sulphur daily. More than a year was required for construction of the plant. How equipment operates; contact is prolonged.

16-20. **Fuel Economy in the Iron Foundry.** Colin Gresty. *Foundry Trade Journal,* v. 72, no. 1430, Jan. 13, '44, pp. 31-33, 34.

Planning is proved to be of major importance in saving fuel.

16-21. **The Dimensions and Rating of the Blast Furnace.** Owen R. Rice. *Blast Furnace and Steel Plant,* v. 32, Feb. '44, pp. 221-226.

Top diameter; furnace volume.

16-22. **Hand-Fired Furnaces.** D. J. Bradbury. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 238-240.

Common sources of heat loss.

16-23. **The History of the Small Steelmaking Converter.** E. C. Pigott. *Engineering,* v. 156, Dec. 31, '43, pp. 535.

History of the Tropenas converter.

16-24. **Electrical Heating Developments in 1943.** Guy Bartlett. *Industrial Heating,* v. 11, Feb. '44, pp. 208, 210, 212.

Brief descriptions of new heating units.

16-25. **Blast Furnace, Coke Plant and Raw Materials Problems Discussed.** *Industrial Heating,* v. 11, Feb. '44, pp. 240, 242, 244, 246.

Gas yield and economy in the coke plant; modern trends in blast furnace design; variations in blowing rates for blast furnaces; and bedding and reclaiming metallurgical raw materials.

16-26. **Oster Plant Heat Treat Utilizes Lead and Salt Bath Pot Furnaces.** *Industrial Heating,* v. 11, Feb. '44, pp. 214, 216, 218.

Description of lead and salt bath pot furnaces used in manufacturing processes of the Oster Manufacturing Co., Cleveland, Ohio.

16-27. **Advantages and Disadvantages of Electric Furnaces.** Victor Paschkis. *Industrial Heating,* v. 11, Feb. '44, pp. 226, 231-232, 234, 236, 238.

Discussion of considerations which apply concerning all applications of electric furnaces, advantages and disadvantages.

16-28. **The Modern Arc Furnace.** T. J. Ess. *Iron & Steel Engineer,* v. 21, Feb. '44, pp. 7-Af-38-Af, Af-41, 44-Af-46-Af, Af-49, Af-53, Af-55, 58-Af.

Summary of the modern arc furnace and ingot production.

16-29. **Conservation of Resources.** E. S. Grumell. *Engineering,* v. 157, Jan. 21, '44, pp. 55-56.

Relative values of different sizes, qualities and types of coal and coke.

16-30. **Blast Furnace Moisture Control.** J. J. Alexander. *Iron & Steel Engineer,* v. 21, Feb. '44, pp. 38-41.

Although considered insufficient to be conclusive, data obtained from this test indicate a more uniform silicon in the iron, an increased metallurgical efficiency, somewhat greater production, with possibly lower coke and limestone consumption.

16-31. **A Unified System of Boiler Control.** *Engineers' Digest,* v. 1, Feb. '44, pp. 151-152.

Recent development in bringing the operation of industrial works boilers into line with modern power station practice—adaptation of the unified system of combustion control.

16-32. **Computation of Steam Boilers by a Graphical Method.** T. Geissler. *Engineers' Digest,* v. 1, Feb. '44, pp. 155-157.

Explanation of a graphical method of steam boiler computation.

16-33. **The Heating of Open-Hearth Furnaces with Mixed Coke-Oven and Blast-Furnace Gas.** R. W. Evans. *Metallurgia,* v. 29, Jan. '44, pp. 125-133.

The author is of the opinion that the best method of firing open-hearth furnaces is to use cold coke-oven gas and tar, tar-oil or pitch, particularly where the very high metallurgical loads which have to be carried require tilting rather than fixed furnaces and where the coke-oven gas is likely to be lean. Flame development; the role of the flame slag foams, their reaction on furnace output and wear; the development of luminosity in coke-oven and blast-furnace gas flames; furnace design; and some metallurgical aspects resulting from the use of mixed gas are discussed.

16-34. **The Suitability of War-Time Coals for Use in Gas Producers.** W. D. Vint. *Metallurgia,* v. 29, Jan. '44, pp. 152-154.

Differences in the raw materials that the iron and steel industry used have created many problems; even coal supplies have caused difficulties, and since coal, whether in the form of coke or gas, is the source of heat, the importance of suitable types of coal cannot be over-estimated.

16-35. **Electronic Processing of Plastic Bonded Molded Plywood.** *Aero Digest,* v. 44, Feb. 15, '44, pp. 104, 106, 108, 132, 136, 139, 141.

How "Duramold" is making use of high frequency methods to solve problem of providing uniform heat to glue lines in laminated wood.

16-36. **H. F. Electrothermics in the Technology of Light Metals.** B. J. Brajnikoff. *Light Metals,* v. 7, Feb. '44, pp. 55-61.

A description of a condenser furnace and details of high-frequency furnace design.

16-37. **Merits of Salt Baths and Air Furnaces.** James Snider. *Automotive & Aviation Industries,* v. 90, March 1, '44, pp. 40-41, 50.

Formed parts can be more efficiently processed in salt baths. Small parts can be handled to advantage in air furnaces. Alloys such as 14S and 17S which are heat treated at different temperatures from 920° F. which is our salt bath operating temperature, are heat treated in air furnaces.

16-38. **Fuel Conservation Opportunities in Industrial Buildings.** Davis M. De Bard. *Industry & Power,* v. 46, March '44, p. 79.

With fuel and manpower becoming more scarce as the war progresses, engineers responsible for heating and ventilating industrial buildings are in a position to assist in the conservation of these resources.

16-39. **Fuel and Metallurgical Furnaces.** R. Whitfield. *Iron & Steel,* v. 17, Feb. '44, pp. 269-274.

Fuel economy.

16-40. **Gas Cleaning.** *Iron & Steel,* v. 17, Feb. '44, pp. 247-249.

Single- and two-stage electroprecipitator units for blast furnaces.

16-41. **Charcoal Pig Iron Project at Rusk, Texas.** Ralph H. Sweetser. *Mining & Metallurgy,* v. 25, March '44, p. 155.

Reconstruction of Pembroke blast furnace and idle charcoal by-products plant of Delta Chemical & Iron Co. at Rusk.

16-42. **Development of Electric Heating for the Wire Industry.** A. E. Bellis. *Wire & Wire Products,* v. 19, March '44, pp. 174-175, 192-194.

The salt-bath furnace has undergone many refinements that have brought it to a high operating efficiency. Some of these developments outlined.

16-43. **Basic Practice Development in the Electric Arc Furnace.** Harry F. Walther. *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 334-341.

Brief historical sketch of electric arc furnace; melting procedure control; bottom requisites; melting and oxidizing; power efficiency.

16-44. **Coke for Metallurgical Purposes.** *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 359-362.

Description of coke ovens; properties of coals used.

16-45. **The Primary Heat Problem of Electric Furnace Design.** Victor Paschkis. *Industrial Heating,* v. 11, March '44, pp. 362-364, 366, 368.

Heat flow problems inherent in industrial electric furnaces.

16-46. **Fuel Proportioning and Temperature Control Applied to Forge Furnaces.** *Industrial Heating,* v. 11, March '44, pp. 378, 380, 382, 384, 386.

Proportioning control; forging furnace design, pusher furnaces; burner plates and blocks, other furnaces; heat treatment.

16-47. **Many Uses Developed for Induction and Dielectric Heating.** *Industrial Heating,* v. 11, March '44, pp. 401-402.

Brazing propeller blades, carbide-facing oil-well drill bits, soldering operations, smoothing plastic sheets, dielectric heating.

16-48. **Mixed Coke-Oven and Blast-Furnace Gas for Open Hearths.** *Industrial Heating,* v. 11, March '44, pp. 416, 460.

Flame development when using mixed coke-oven and blast-furnace gas as open hearth fuel. Iron & Steel Institute Paper.

16-49. **Cupola Lighting.** *Iron & Steel,* v. 17, March '44, p. 296.

New range of torches using town or producer gas.

16-50. **Pitch as an Open Hearth Fuel.** J. F. Wilbur. *Iron & Steel Engineer,* v. 21, March '44, pp. 65-73, 77.

Properly handled, pitch makes an excellent fuel for open hearth furnaces. Tests show increased production, but at the expense of slightly higher heat requirement.

16-51. **DPC Blast Furnace at Republic Cleveland.** *Iron & Steel Engineer,* v. 21, March '44, pp. 85-87.

Description of plant.

16-52. **Fuel Conservation Through Gas Burner Adjustment.** E. R. Murphy. *Industrial Gas,* v. 22, April '44, pp. 17-18, 40.

Maintenance of correct industrial burner adjustment has been emphasized as a means toward obtaining uniform and efficient furnace performance and the furnace atmosphere most suitable to the heating process, consistent with performance efficiency. Maximum fuel efficiency of equal importance.

16-53. **Metal Melting in Small Plants.** A. H. Koch. *Industrial Gas,* v. 22, April '44, pp. 32, 39.

Tilting crucible furnaces, superheat pot furnaces.

16-54. **Future of Liquid and Gas Fuels.** Gustav Egloff. *Industry & Power,* v. 46, April '44, pp. 58-60.

Egloff believes that for a long time we will have sufficient petroleum for our essential needs in motor fuels and lubricants; that technical developments will probably minimize the production of residual oils that can be burned economically under boilers and other industrial equipment.

16-55. **Induction Heating Advantages Warrant New Designing Techniques.** Frank W. Curtis. *Product Engineering,* v. 15, April '44, pp. 242-245.

Economical, uniform heat applied rapidly to localized areas will tend to simplify manufacturing processes and contribute to improving products. Design modifications are often necessary to permit high frequency heating operations.

16-56. **Gas Washing Developments.** H. O. Johnson. *Blast Furnace & Steel Plant,* v. 32, April '44, pp. 46, 48, 50.

Description of washer, performance of washer, water requirement, condition of stoves, hearth construction—Donora blast furnace No. 1.

16-57. **Automatic Calorific Value Control and the Volumetric Proportioning of Coal Gas.** *Machinery (Lloyd),* v. 16, March '44, pp. 47-49.

One of the simplest ways of producing gas of a constant calorific value is to dilute the rich gas coming from the retorts with a gas of lower calorific value,

such as producer gas or bluewater gas. This can be done by controlling the diluent stream mechanically.

16-58. **Relationships between Bath Volume, Hearth Volume and Electric Load in Electric Melting Furnaces.** Victor Paschkis. *Industrial Heating*, v. 11, April '44, pp. 558, 560, 562, 592.

Relationships between bath volume, hearth volume and electric load in electric melting furnaces. Various phases of electric furnace design and operation.

16-59. **What About the Future of the Combustion Gas Turbine?** F. K. Fischer and C. A. Meyer. *Steel*, v. 114, May 1, '44, pp. 110, 154-155.

Advantages of the gas turbine cycle: No boiler is used; water is not required; promises greater efficiency improvement at high temperature; and high horsepower per pound output for short life applications.

16-60. **Procedure Followed in Hearth Construction.** H. O. Johnson. *Steel*, v. 114, May 8, '44, pp. 120, 123.

Construction of blast furnace hearth at plant in Pittsburgh district includes subhearth cooling facilities extending 6 ft. below regular hearth cooling plates. Details of hearth installation are presented. Combination primary and secondary gas washer designed to clean 18,000 cu. ft. of gas per min. provides fuel with cleanliness of 0.025 grain per cu. ft. for stoves lined with 2¾-in. checkers.

16-61. **Blowing Rates of Various Blast Furnaces.** E. L. Clair. *Iron and Steel Engineer*, v. 21, April '44, pp. 35-39.

Investigation of furnace data shows the relation between blast volume and stockline area to be practically constant over the entire range of furnace sizes, while the more commonly used relation between blast volume and hearth area varies widely.

16-62. **Plate Mill Heating Furnaces.** A. J. Fisher. *Iron and Steel Engineer*, v. 21, April '44, pp. PM 59-61, 63, 66.

Modern in-and-out furnaces designed and built by Bethlehem.

16-63. **Pusher-Furnace Trays and Baskets Designed for Longer Life.** W. A. Hakin. *American Machinist*, v. 88, April 27, '44, pp. 102-104.

These furnace accessories must eventually wear out, but their service life will be extended by observing known structural principles and approved foundry practice during their selection.

16-64. **Radiant Heating for Industrial Processes. "Infra-Red" by Gas.** L. W. Andrew and E. A. C. Chamberlain. *Engineers' Digest*, v. 1, April '44, pp. 289-292.

Convection versus radiant heating; suitable intensities of radiation; absorption of radiation; performance; air temperature between panels during operation.

16-65. **Gas Flames: The Case for Aeration Entirely at the Point of Combustion.** Dean Chandler. *Engineers' Digest*, v. 1, April '44, pp. 293-294.

Improvement in the flexibility of oven flames is limited more by the burners than by any other factor. Ovens can be designed more satisfactorily if non-aerated burners are used.

16-66. **Importance of Proper Choice of Heat Exchanger Surface, Particularly in Power Plant Equipment.** K. Jaroschek. *Engineers' Digest,* v. 1, April '44, pp. 302-304.

Heat transmission coefficients of heat exchangers.

16-67. **A Graphite-Rod Resistance Type Melting Furnace.** A. Kropf. *Engineers' Digest,* v. 1, April '44, p. 304.

Offers considerable advantages and capable of producing a steel in no way inferior to crucible steel made in the ordinary way.

16-68. **Why Fuel Conservation Is Imperative From Now Until April, 1945.** Davis M. DeBard. *Industry and Power,* v. 46. May '44, pp. 56-58.

This year we have no other choice but to save 25 million tons by the elimination of all coal waste. New charts show consumption pattern.

16-69. **Gears Carburized in Electric Salt Bath Furnace at Yale & Towne Plant.** Howard Linn Edsall. *Industrial Heating,* v. 11, May '44, pp. 704-706, 711-712, 714.

In order to avoid oxidation, the necessity for sand blasting, or distortion after heat treatment, the liquid carburizing method is preferred. A furnace of the immersed electrode (Ajax-Hultgren standard 65-kw. size with roller-type cover) is used.

16-70. **Utilization of Fuel Gas in War Production: II.** Roger W. Jackson. *Industrial Heating,* v. 11, May '44, pp. 726, 728, 730, 732, 734, 736.

Phases of production of war materials, with special reference to the utilization of gas-fired equipment in the manufacture of construction materials, armor plate, petroleum products, synthetic rubber, aerial bombs, etc. The design of gas burners to be used against considerable back pressures, notably in large car-type furnaces.

16-71. **Relationships Between Bath Volume, Hearth Volume and Electric Load in Electric Melting Furnaces: II.** Victor Paschkis. *Industrial Heating,* v. 11, May '44, pp. 738-740, 742.

The influence of such factors as size and shape, heat losses per unit time, spacing of electrodes, speed and uniformity of melting and metallurgical considerations on the choice of a particular type of electric furnace to meet a given set of operating conditions.

16-72. **Refining and Deoxidizing Practice in Basic Electric Steel Furnaces.** *Industrial Heating,* v. 11, May '44, pp. 752, 754.

Reasons for oxidation; method for the removal of FeO in the metal before slagging off; sources of hydrogen.

16-73. **Recent Developments in Utilization of Gas in Industrial Furnaces.** Carroll Cone. *Steel Processing,* v. 30, May '44, pp. 309-315.

Gas carburizing, gas pickling, flame impact heating, other innovations in heat treating, current and proposed developments, the challenge of the future.

16-74. **Manteca Magnesium Plant Solves Furnace Difficulty.** *Western Metals,* v. 2, May '44, pp. 68, 70.

Burner in a hot air high heat furnace installed by Natural Gas Equipment Co. in a Los Angeles plant. The head is the one used in the NGE 1000 series gas

burner in oil country boilers—industrially known as the NGE No. 314.

16-75. **Bending Time of Aircraft Spar Caps Reduced by Induction Heating.** E. H. Plesset, J. R. Chadwick. *Automotive Industries,* v. 90, May 15, '44, pp. 20-21, 86.

Investigation by Douglas Aircraft Co. engineers of the possibility of heating spar cap billets quickly by an induction method reveals the complete feasibility of this method for achieving a uniform temperature of 350 to 400° F. within a few minutes in the region to be bent, in contrast to the gas furnace method which required two hours. A schematic diagram of the basic method.

16-76. **Electrometallurgical Treatment of Ores.** Charles Hart. American Iron and Steel Institute Advance Paper, May 25, '44, 14 pp.

Furnaces for production of ferro-alloys; processes for ferrosilicon, ferrochrome, ferrotungsten, ferromanganese and pig iron.

16-77. **A Quenching Furnace Suitable for Small Specimens.** E. A. Owen. *Journal of Scientific Instruments,* v. 21, April '44, pp. 65-66.

A furnace is described for the rapid quenching of small specimens, in lump or in powder form, from temperatures up to about 1000° C. The specimens are enclosed in small evacuated silica, pyrex, or soda-glass containers, according to the temperature quenched from, and these are mounted in holes bored in a steel block which is supported near the center of the furnace.

16-78. **Motor Generator and Electronic Units.** J. P. Jordan. *Metals & Alloys,* v. 19, May '44, pp. 1153-1154.

Fields of use of the motor-generator set and of the vacuum tube oscillator for induction heating; with examples.

16-79. **Control for Electric Arc Furnaces.** L. V. Black. *Iron & Steel Engineer,* v. 21, May '44, pp. 35-41.

A prospective buyer analyzes the latest type. Analysis made from a study of prints, pamphlets, and literature published by manufacturers. Object is to explain, in not too much detail, the features of the various controls.

16-80. **Centralized Lubrication for Blast Furnaces.** A. J. Jennings. *Iron & Steel Engineer,* v. 21, May '44, pp. 42-46, 56.

Centralized lubrication on blast furnaces preserves equipment, reduces lost time, saves critical materials, and provides complete safety for the oiler.

16-81. **Advancement in Heat Application to Gas-Fired Furnaces.** James Kniveton. *Industrial Gas,* v. 22, June '44, pp. 13-16, 38-39.

New technique by which a multiplicity of small heat sources can be applied directly toward the objects heated; and arrangement of the heat sources in a very definite pattern in accordance with the heat requirements of the furnace.

16-82. **Blast Furnace Blowers Driven by Gas Turbines.** Paul R. Sidler. *Steel,* v. 114, June 5, '44, pp. 122-126.

Gas turbine-driven axial blower handles much larger air volume than furnace requires. Variation in speed is possible over wide range. Considerable part of compressed air is used for reducing temperature of combustion gases to desired limit.

16-83. **Metallic Recuperators Increase Heating Efficiency.** John H. Loux. *Steel,* v. 114, June 12, '44, pp. 116-118.

Preheating of air used for combustion affords higher flame temperature, more perfect combustion and more uniform heating of product. Fuel costs involved in bringing billets to proper temperature may be lowered by the exchange of heat.

16-84. **Heat Treatment Furnaces for Light Metals.** A. von Zeerleder. (*Schweizer Archiv.,* v. 9, '43, p. 197.) *Light Metals,* v. 7, May '44, pp. 249-256.

Theory and practice, design, operation and maintenance of heat treatment plant.

16-85. **Aluminum Aircraft Parts Heat Treated in Large Salt Bath Furance.** F. K. Whiteside. *Industrial Heating,* v. 11, June '44, pp. 892, 894, 896, 898, 900.

Pot dimensions, burner equipment, furnace construction and operating characteristics, control, piloting, safety equipment.

16-86. **Electrical Equipment (Other Than Busses) for Industrial Electric-Arc Furnaces.** Victor Paschkis. *Industrial Heating,* v. 11, June '44, pp. 902, 904, 906, 908, 910, 912.

Transformer and reactor equipment, furnace control, and control of electrode movement.

16-87. **Fuels of the Future.** R. A. Sherman. *Industrial Heating,* v. 11, June '44, pp. 922-924, 926.

Existing known supplies of coal, oil and natural gas, and the probable extent of their availability in coming years, along with suggested means for conserving and obtaining maximum utilization from these fuels.

16-88. **High Frequency Induction Heating.** G. E. Shaad. *Iron & Steel Engineer,* v. 21, June '44, pp. 66-73, 88.

Induction heating offers advantages that justify its use in many applications.

16-89. **Pulverized Coal Firing of Metallurgical Furnaces.** L. S. Wilcoxson. *Iron & Steel Engineer,* v. 21, June '44, pp. 74-85, 88.

Applications of pulverized coal to heating operations in the iron and steel industry.

16-90. **Blast Furnace Tap Hole Area.** C. F. Hoffman. *Steel,* v. 114, June 26, '44, pp. 119-220.

Severe erosion of brickwork beneath iron notch occurs when cast iron segments with cast-in pipes are employed for cooling. Condition is eliminated by installing jackets and coolers in well and then driving bottom blocks, carefully sized and properly cut and ground, into position.

16-91. **Steam in Steelworks—II.** G. Graham. *Iron & Steel,* v. 17, May '44, pp. 353-359.

The ever-changing supply situation necessitates alterations in some of the methods to meet temporary difficulties in obtaining materials. Ways by which quick

returns are obtainable in the fight for fuel efficiency. Parallel slide and other valves are dealt with; insulating steam pipes in forges.

16-92. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas,* v. 23, July '44, pp. 20, 38, 40, 42.

Fuels from the viewpoint of heating hot-dip galvanizing furnaces: Electric heat.

16-93. **High-Frequency Heating in Industry.** *Westinghouse Engineer,* v. 4, July '44, pp. 105-110.

Eddy currents, skin effect, and dielectric loss; characteristics harnessed. In the field of metal melting, brazing, soldering, hardening, and curing, the operations are being done better or faster, and many cannot be done by any other method.

16-94. **Open-Hearth Furnaces.** A. H. Leckie. *Iron & Steel,* v. 17, May 18, '44, pp. 399-404.

A method for investigating the performance of open-hearth furnaces by the statistical examination of routine works records. How appropriate correlation methods may be used to determine the optimum gas rate and air-gas ratio, and to investigate the effect of many variables in a quantitative way and the changes in thermal efficiency under various conditions. Simple methods of measuring and calculating the quantities involved.

16-95. **Mixed Gas Heating.** R. W. Evans. *Iron & Steel,* v. 17, May 18, '44, pp. 415-419.

Open-hearth firing with coke oven and blast furnace gas mixtures.

16-96. **Pulverized Coal Firing of Malleable Iron Annealing Kilns.** *Industrial Heating,* v. 11, July '44, pp. 1092, 1108.

Uses of pulverized coal as fuel in the malleable industry with relation to melting furnaces. Need for larger combustion space with this fuel necessitated raising the roofs of the kilns.

16-97. **Continuous Furnace Coordinates Heating and Handling of Copper Bars.** *Industrial Heating,* v. 11, July '44, pp. 1094, 1108.

A description of a continuous furnace designed to smooth production flow into and from the furnace so as to synchronize with the desired rate of charging and the rate of bar feed to the mill.

16-98. **Control of Atmosphere in Open-Fired Furnaces.** F. A. Locke. *Iron Age,* v. 154, July 27, '44, pp. 36-38, 126, 128, 130.

Definite need for controlling the atmosphere in an open-fired furnace. Variables that must be controlled, the type of atmosphere most suitable and how the characteristics of various atmospheres may be judged.

16-99. **Guide to Furnace Selection.** D. H. Gardner. *Iron Age,* v. 154, August 3, '44, pp. 60-64, 138.

Determining the heating time required, the heating medium to be used, and from these, the type of furnace best suited for a particular heat treating opera-

tion with regard for the production required and the weight and size of the material to be heated.

16-100. **Efficiency of Induction Heating Coils.** George H. Brown. *Electronics,* v. 17, August '44, pp. 124-129, 382-385.

Examination of the action occurring in induction heating of metals, including analysis of current distribution in work coil and load, relation between frequency and coupling efficiency, impedance considerations and discussion of factors affecting choice of frequency.

16-101. **Platform at Iron Notch Protects Furnacemen.** *Steel,* v. 115, August 7, '44, p. 116.

Acts as a working platform while drilling out the tap hole and, in case of a break-through into the molten iron while drilling, deflects the flame or sparks into the space between its lower surface and the iron trough.

16-102. **Changes in Brass Furnace.** Thomas Henry. *American Foundryman,* v. 6, August '44, p. 7.

Cut melting time and waste by oxidation.

16-103. **Design of Electronic Heaters for Induction Heating.** J. P. Jordan. Institute of Radio Engineers *Proceedings,* v. 32, August '44, pp. 449-452.

Choice of the circuit to be used, the tank current, operating frequency, and the physical construction are dependent upon a knowledge of the theoretical and practical requirements of induction heating, and an understanding of the operating condition to be met in the average factory.

16-104. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas,* v. 23, August '44, pp. 21-22, 40-44.

A discussion of galvanizing furnace parts, and requirements; the brickwork, steelwork, shell, bracing, combustion chambers, flues, and stack.

16-105. **Granite City Steel Company Increases Production Facilities.** Charles Longenecker and Ralph Vaill. *Blast Furnace and Steel Plant,* v. 32, August '44, pp. 919-926.

To increase the ingot capacity of the plant, three 175-ton open-hearth furnaces were erected. Other improvements throughout the plant include the erection of a chemical and metallurgical laboratory of modern design and equipment, the addition of a fourth steam generator, extensions to several buildings, including the general office.

16-106. **The Heating of Open-Health Furnaces with Mixed Coke-Oven and Blast Furnace Gas.** R. W. Evans. *Blast Furnace and Steel Plant,* v. 32, August '44, pp. 932-935.

Effect of luminosity on slag foams; effect of foaming slags on refining; luminosity in mixed-gas flames. 7 ref.

16-107. **Inflating Blast Furnace Gas Mains with Coke Oven Gas.** Leonard Tofft. *Blast Furnace and Steel Plant,* v. 32, August '44, pp. 936-937.

Use of coke oven gas to keep the mains inflated during a shutdown has proved successful; it has been found that only a nominal amount of coke oven gas, about 235 cu. ft. per min., is required to maintain 15 in. of pressure in the system.

16-108. **A Coreless Induction Furnace in the Cast Steel Industry.** Fritz Harms. *Stahl und Eisen,* v. 64, no. 11, March 16, '44, pp. 175-178.

Description of an installation consisting of two 2.5-ton and one 0.5-ton furnaces; average output of the installation, melting time, and the conditions of slagging; the advantages of the coreless induction furnace; cost of the installation; current consumption; cost of production. Tensile properties of 20 plain carbon (0.16 to 0.45%) and of 25 alloy steels (1 Mn, 1½ Cr, ¼ Mo, 0.08 V; 1 Cr, 0.10 V; 1½ Mn, 0.15 V; 2¼ Cr, ¼ Mo, 0.10 V; 1¼ Mn, 0.10 V) made in the induction furnaces tabulated.

16-109. **Voltage Transients in Arc-Furnace Circuits.** *Electrical Engineering,* v. 63, August '44, pp. 563-568.

Transient voltages in arc-furnace circuits; installation and test data.

16-110. **Electronic Regulator for Arc Furnaces.** J. E. Reilly and C. E. Valentine. *Electrical Engineering,* v. 63, August '44, pp. 601-603.

Electronic regulator which controls electrode position as determined by response to current in the electrode and voltage between the electrode and the furnace shell. Features and performance of an installation for a furnace having hydraulic control.

16-111. **Physical and Mechanical Aspects of Combustion.** *Industrial Heating,* v. 11, August '44, pp. 1288, 1290.

Combustion characteristics; combustion in the open-hearth; characteristics of a combustion system.

16-112. **A New Principle in Gas-Fired Furnaces.** *Machinery* (London), v. 64, June 22, '44, p. 678.

Construction; advantages.

16-113. **Recent Advancements in Industrial Heating Processes and Equipment. II.** *Industrial Heating,* v. 11, August '44, pp. 1258, 1260, 1262, 1264, 1266, 1268.

High temperature salt baths; patterned burner application; billet heating furnaces; developments in separately prepared furnace atmospheres; electric salt bath furnaces; new basis needed for rating furnace production.

16-114. **Recent Developments in Industrial Furnaces.** H. C. Hottel. *Iron Age,* v. 154, August 31, '44, pp. 30-32.

Fundamental concepts of heat transfer, energy balance, physical chemistry and materials of construction for modern industrial furnaces.

16-115. **The Fuel Systems at Great Lakes Steel Corporation.** F. C. Frye. *Iron & Steel Engineer,* v. 21, August '44, pp. 78-82.

With oil as the principal fuel, mixed blast furnace and coke oven gas is automatically added to the open hearth furnaces as the supply exceeds other needs.

16-116. Ideal Postwar Enamel Plant for Cast Iron. II. Fred M. Burt. *Ceramic Industry,* v. 43, Sept. '44, pp. 58-60.

New type furnaces described and automatic process recommended.

16-117. New Ways and Means of Compressing and Heating Blast Air in Iron Works. *Brown Boveri Review,* v. 30, Nov.-Dec. '43, pp. 368-375.

Special advantages obtained through combination of blast compression and heating and by employing a gas turbine to drive the blast blower.

16-118. Underfeed Stokers for Metallurgical Heating Furnaces. *Foundry Trade Journal,* v. 73, August 3, '44, p. 279.

Advantages and limitations; limitations of stokers; automatic control.

16-119. Recent Developments in Industrial Furnaces. H. C. Hottel. *Mechanical Engineering,* v. 66, Sept. '44, pp. 609-610.

Heat transfer; energy balance; mechanics; materials of construction; chemical process control; combustion.

16-120. Slag-Metal-Oxygen Relationships in the Basic Open-Hearth and Electric Processes. J. S. Marsh. American Institute of Mining and Metallurgical Engineers Preprint, Oct. '44, 11 pp.

Carbon-oxygen equilibrium; carbon-oxygen reaction; behavior of oxygen in the basic electric furnace. 8 ref.

16-121. Energy Balance of Electric Arc Furnaces. VI. Victor Paschkis. *Industrial Heating,* v. 11, Sept. '44, pp. 1430, 1432, 1434, 1436, 1438, 1440.

Traditional balances discussed and analyzed. Electric losses are in part dependent (on heat losses) and in part proportional (to the useful load). Raises the question which, if any, type of losses should be preferred in order to obtain best overall efficiency. 5 ref.

16-122. Factors Affecting Transfer of Heat from Flame to Bath in Open Hearth Furnaces. *Industrial Heating,* v. 11, Sept. '44, pp. 1466, 1468, 1470.

Methods of obtaining a rapid and high percentage of heat transfer from flame to bath in open-hearth furnaces.

16-123. Accepting a Challenge. David McAllen Henderson. *Blast Furnace & Steel Plant,* v. 32, Sept. '44, pp. 1071-1075, 1104.

Demand for close dimensional requirements and unblemished surface on bar products requires understanding of effect of furnace atmosphere upon such requirements. Essential that billets and slabs be heated to rolling temperature and the heating be performed with an atmosphere in the furnace which will give a finished product which meets all requirements. Scaling action; decarburizing; heating rate; conductivity; soaking.

16-124. Some Trends in Coke Oven Design. D. T. Barritt and R. J. Barritt. *Blast Furnace & Steel Plant,* v. 32, Sept. '44, pp. 1080-1086.

New designs and ideas to illustrate the probable lines of post-war development and to show that, in spite of

present-day restrictions, coke-oven designers are searching for better methods. Accurate control; length of flame.

16-125. **The Heating of Open-Hearth Furnaces with Mixed Coke-Oven and Blast Furnace Gas. III.** R. W. Evans. *Blast Furnace & Steel Plant,* v. 32, Sept. '44, pp. 1087-1089.

Port cooling; port velocity and slope; artificial luminosity; air requirements.

16-126. **Arc Furnaces.** C. C. Levy. *Iron & Steel,* v. 17, August '44, pp. 572-575, 580.

Power supply developments, past and future.

16-127. **New Studies of Melting and Casting Conditions for Chromium-Nickel-Molybdenum and Chromium-Molybdenum Steels in Basic Electric and Basic Open-Hearth Furnaces.** Wolfram Ruff. *Stahl und Eisen,* v. 63, '43, pp. 438-442. *Alloy Metals Review,* v. 3, March '44, p. 1.

Commercial operations with a 20-ton electric furnace and an open-hearth furnace of similar capacity are compared on the basis of approximately 400 melts during a 7-month period. Steels contained Cr 1.4, Ni 2.7 and Mo 0.25% and Cr 2, Ni 0.3 and Mo 0.25%. Spoon, ladle and pouring temperature of the electric Cr-Ni-Mo steels were 5 to 10°F. lower than those of the electric Cr-Mo steels and slightly higher than the Cr-Ni-Mo open-hearth steel. Yield strength, tensile strength and elongation of electric and open-hearth steels were approximately equal, but the former steels had definitely superior reduction of area and impact strength.

16-128. **Monometer Tilting and Rotary Furnaces for Metal Melting.** *Engineering,* v. 158, August 25, '44, p. 146.

Description of types of tilting and rotary metal-melting furnaces.

16-129. **Factors Influencing the Moisture Content of Furnace Atmospheres.** F. Gilbert and E. Scheuer. *Metallurgia,* v. 30, August '44, pp. 187-190.

Number of sources from which this moisture content may be derived, but the authors direct particular attention to the hydrogen and water content of the fuel and air used for combustion. Graphs have been prepared which give quickly, and with reasonable approximation, the water content of the combustion gases, if the water and hydrogen content of fuel and combustion air are known.

16-130. **Fires Forging and Heat Treating Furnaces With Pulverized Coal.** R. A. Campbell and J. H. Loux. *Steel,* v. 115, Oct. 2, '44, pp. 90-92, 94.

Circulating load of about 60% of pulverized capacity is carried constantly in distributing line thus affording an interrupted supply of coal at burners. Each burner can be adjusted without affecting feed to other burners. Zone temperatures of heat treating furnaces controlled automatically to give uniform annealing and drawing operations.

16-131. **Acid Electric Steel-Making Practice.** Conrad C. Wissmann. *Metal Progress,* v. 46, Oct. '44, pp. 723-726.

Instructions to aid those working with the operation of the furnace and the process of steel making.

16-132. **Furnace Hearths.** *Iron & Steel,* v. 17, Sept. '44, p. 607.

Heat resisting metallic tiles to prevent distortion.

16-133. **Coke Properties and Cupola Melting.** B. P. Mulcahy. *Foundry,* v. 72, Oct. '44, pp. 78-79, 202-204, 206, 208.

Critical inspection of the inherent properties of coke which affect and are affected by the process of cupola melting. 4 ref.

16-134. **Elevated Temperatures Without Preheated Air.** P. W. Craig. *Industrial Gas,* v. 23, Oct. '44, pp. 13-15.

A recommendation in favor of well-designed gas utilization equipment for test, laboratory or shop furnaces where only occasional use of high temperatures makes an investment for preheated air uneconomical.

16-135. **Basic Principles of Combustion Engineering of Hot - Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas,* v. 23, Oct. '44, pp. 23, 40-44.

Galvanizing furnaces, coal fired.

16-136. **Magnetic Devices Control Speed of Roller-Hearth Furnaces.** G. W. Heumann. *American Machinist,* v. 88, Oct. 12, '44, pp. 106-109.

Automatic sequence controls and interlocking devices govern the passage of work trays through a heat treating machine. Several ways of installing motor control are available, depending on the size of the furnace and space.

16-137. **Heating for Forging.** John Mueller. *Steel Processing,* v. 30, Oct. '44, pp. 667-669.

Slot type forging furnace; rotary hearth forging furnace; control of scale; heating input of various steels.

16-138. **Electric Furnace Steelmakers Consider Operating Problems.** *Steel,* v. 115, Oct. 16, '44, pp. 113-114, 142, 144, 146, 148.

Melters cautioned on use of shell scrap from battlefields. Clean roofs stressed. Handling of refractories and electrodes described.

16-139. **Electric Furnace Operators Debate Production Problems.** *Iron Age,* v. 154, Oct. 19, '44, pp. 68-73.

Factors affecting roof life and lining of electric furnaces; construction methods for side walls and bottoms of basic furnaces; chromium loss and recovery, and control of residual chromium.

16-140. **Induction Furnaces for Melting Metals and Alloys.** J. Minssieux. *Bulletin de la Societe Francaise des Electriciens,* v. 4, no. 33, Jan. '44, pp. 12-19. *Engineers' Digest,* v. 1, Sept. '44, pp. 563-564.

Two principal types of induction furnaces distinguished are furnaces with closed magnetic circuit; furnaces without magnetic circuit.

16-141. **Producer Gas for Small Heat-Treatment Furnaces and Other Processes.** *Metallurgia,* v. 30, Sept. '44, pp. 269-271.

The simplicity of the producer unit and its ease of operation are such that it can be confidently recom-

mended as a permanent unit for providing a steady supply of gas for individual heat treatment processes or for a collection of small demands occurring at a distance from the central producer plant.

16-142. **First Report on the Basic Cupola by the Melting Furnaces Sub-Committee.** *Foundry Trade Journal,* v. 74, Sept. 28, '44, pp. 71-74.

Examination of results obtained in practice with basic-lined cupolas.

16-143. **The Heating of Open-Hearth Furnaces with Mixed Coke-Oven and Blast Furnace Gas.** R. W. Evans. *Blast Furnace & Steel Plant,* v. 32, Oct. '44, pp. 1205-1207.

Mixed-gas operation; mixed gases and dolomite consumption; metallurgical considerations.

16-144. **An "In-and-Out" Plate Mill Furnace With Two Twenty-One-Foot Door Openings.** L. S. Longenecker. *Blast Furnace & Steel Plant,* v. 32, Oct. '44, pp. 1208-1212.

Door control mechanism; permits 60% increase in tonnage charged; uniform temperature throughout furnace; withstands heavy duty service.

16-145. **Blast Furnace Moisture Control.** John J. Alexander. *Blast Furnace & Steel Plant,* v. 32, Oct. '44, pp. 1213-1219.

Benefits derived from controlled moisture of the blast are sufficient to offset the additional cost of the furnace.

16-146. **Core Ovens in the Aircraft Engine Industry.** H. E. Linsley. *Industrial Heating,* v. 11, Oct. '44, pp. 1717, 1718, 1720, 1722, 1724, 1726, 1730, 1732, 1734, 1738.

Description of the main ovens used for regular production.

16-147. **Producer Gas.** *Iron & Steel,* v. 17, Oct. '44, pp. 647-649.

For small heat treatment furnaces and other processes.

16-148. **Automatic Manipulation of Open-Hearth Furnace Doors.** C. C. Downie. *British Steelmaker,* v. 10, Oct. '44, pp. 440-442.

Advantages of the automatic system; the improved electrical device used.

16-149. **Determination of the Profiles of Blast Furnaces.** W. Goldsbrough and S. G. Throssell. *British Steelmaker,* v. 10, Oct. '44, pp. 443-453.

Profiles of some continental blast furnaces which are operating on very rich and easily smeltable burdens and an excellent quality of coke. The furnaces are hard driven and show specific performances outside the range of those already given for furnaces working under ordinary or less favorable conditions.

16-150. **Gas Producers and Producer Gas.** L. L. Swift. *Iron & Steel Engineer,* v. 21, Oct. '44, pp. 45-48.

Tight supplies of oil and gaseous fuels and sharp increases in their prices, has reawakened interest in gas producers. Developments in gas cleaning and in anthracite or coke producers have widened the field of producer gas application.

16-151. **Modern Blast Furnace Design and Operation.** James Dale. *West of Scotland Iron & Steel Institute Journal,* v. 51, pt. 4, pp. 45-106.

Developments of the American type of furnace.

16-152. **Coke Properties and Cupola Melting.** B. P. Mulcahy. *Foundry,* v. 72, Nov. '44, pp. 94-97, 222, 224, 226.

Influence on cupola operations of various physical and chemical properties of foundry coke. 2 ref.

16-153. **Open Hearth Steelmakers Discuss Shop Problems.** John D. Knox. *Steel,* v. 115, Nov. 13, '44, pp. 134-135.

Discussions are candid; special refractory applications; suited to endwall service; bottom performance; factors affecting cleanliness.

16-154. **The Selection of Coals for Carbonization.** B. P. Mulcahy. *Blast Furnace & Steel Plant,* v. 32, Nov. '44, pp. 1322-1327.

Various aspects of simple means for the certain identification of good or bad coals. 13 ref.

16-155. **Purging Operations and Controls.** Hugh E. Ferguson. *Blast Furnace and Steel Plant,* v. 32, Nov. '44, pp. 1334-1340, 1373.

Purging efficiency; factors affecting purging efficiency; taking holder out of service; purging out of service; purging holder into service; example of holder purging; purging of plant mains.

16-156. **Furnaces for Salt Baths.** Leon D. Slade. *Metal Progress,* v. 46, Nov. '44, pp. 1089-1090.

Advantages of metal containers vs. ceramic pots; transformer requirements; pyrometers.

16-157. **Small Producer-Gas Heat Treatment Furnaces.** *Metal Treatment,* v. 11, Autumn '44, pp. 157-160.

A small producer-gas plant, suitable for heat treatment and other processes, which was originally designed as a stand-by unit for firing furnaces whose normal operation might be interrupted by enemy action. Suitable as a permanent unit for providing a steady supply of gas for individual heat treatment processes located at a distance from the central producer plant.

16-158. **High-Speed Heating of Heavy Metal Work.** Carl H. Lekberg. *Industrial Gas,* v. 23, Nov. '44, pp. 9-10.

Air-gas combustion for the high-speed heating (to forging, extruding, annealing and hardening temperatures) of heavy metal work.

16-159. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas;* v. 23, Nov. '44, pp. 18-19, 31-33.

Galvanizing furnaces—coke fired.

16-160. **Blast Furnaces.** A. J. Jennings. *Iron & Steel,* v. 17, Nov. '44, pp. 676-679.

Centralized lubrication.

16-161. **Heat Exchange.** *Iron & Steel,* v. 17, Nov. '44, pp. 684-685.

"Incandescent" thermobloc recuperator for waste heat recovery.

16-162. Metal Heating Furnaces. R. S. van der Spuy. *Journal* of the South African Institution of Engineers, v. 42, Dec. '43, and Jan. '44, pp. 66-89. Abstract, Iron and Steel Institute *Bulletin*, no. 106, Oct. '44, p. 148-A.

Operating metal heating furnaces to the best advantage. The following factors are dealt with: the temperature of the furnace; handling of materials; firing of the furnace; the effect of the size of the charge; heat transmission to the charge; the furnace gases; the effect of furnace construction; and furnace efficiency.

16-163. Considerations on Blast-Furnace Practice. T. P. Colclough. Iron & Steel Institute, Advance Copy, Oct. '44, 18 pp.

Considerable economies in coke consumption may be effected in many blast furnaces. To secure these economies it is necessary to attain a higher efficiency in the combustion of the carbon used within the furnace and to reduce as far as possible the weight of the slag-forming oxides charged in the burden.

16-164. The Aachen Hot Blast Cupola. E. Piwowarsky. *Die Giesserei*, v. 30, no. 20/22, Oct. '43, pp. 221-225. *Engineers' Digest*, v. 1, Nov. '44, pp. 669-671.

The use of a hot blast offers considerable advantages, uniformity of operation with the slagging of the tuyeres also decreasing.

16-165. Working a Heat of Acid Electric Steel (Notes for Operators). Conrad C. Wissmann. *Metal Progress*, v. 46, Dec. '44, pp. 1277-1284.

The cause of the "boil"; how it is started and stopped; the desirable amount of carbon at the end of the boil (as related to the specification for the finished casting); the undesirable "silicon boil"; the danger of over-oxidized or over-reduced baths and how to prevent their occurrences.

16-166. Pulverized Coal Firing of Malleable Iron Annealing Kilns. L. S. Wilcoxson and D. F. Sawtelle. American Foundrymen's Association *Transactions*, v. 52. Dec. '44, pp. 552-563.

By direct firing an old hand-fired kiln, followed by the conventional pair of car type periodic kilns fired alternately with one pulverizer; and the more recent installation of a direct-fired circulating system with which any or all of the five kilns can be fired from one pulverizer.

16-167. Modern Blast Furnace Design and Operation. James Dale. *Blast Furnace and Steel Plant*, v. 32, Dec. '44, pp. 1451-1456.

Developments of the American type of furnace.

16-168. Generalization of Blast Furnaces. Georg Bulle. *Stahl und Eisen*, v. 64, no. 18, May 4, '44, pp. 285-294.

In cooperation with blast furnace constructors and blast furnace metallurgists, a generalized type of blast furnace was developed. Suggestions made for standardization of parts.

16-169. Applying Industrial Gas in the Metals Field. H. M. Heyn. *Industrial Gas*, v. 23, Dec. '44, pp. 12-13.

Potential markets.

16-170. **Recent Evolutions in Process Heating with Gas.** Harry W. Smith. *Industrial Gas,* v. 23, Dec. '44, pp. 14-15, 31.

Higher speed heating. New gas-fired heat treating equipment.

16-171. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces, XXIII.** Wallace G. Imhoff. *Industrial Gas,* v. 23, Dec. '44, pp. 16-17, 31-36.

Galvanizing furnaces—gas fired.

SECTION XVII

REFRACTORIES AND FURNACE MATERIALS

17-1. **Refractory Realization in 1943.** Adrian G. Allison. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 85-88.

Discussion of types of refractories, their various uses, and the probability of their adequate supply.

17-2. **Steel Plant Refractories Problems.** Louis A. Smith. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 104-108.

Discussion of blast furnaces, insulation, silica brick, checkers, and types of brick.

17-3. **Open Hearth Construction with Basic Brick.** H. M. Griffith. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 83-84.

Description of a basic brick furnace and the results of its operation since January, 1943.

17-4. **Zircon Refractories for Aluminum Melting Furnaces.** R. W. Knauft. *Metals and Alloys,* v. 18, no. 6, Dec. '43, pp. 1326-1330.

Improvement of hearth and production rate and quality of metal with Zircon refractories.

17-5. **The Use of Basic-Lined Ladles in the Desulphurisation of Cast Iron by Sodium Carbonate.** *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 17-19.

During recent years there has been a demand for a greater degree of desulphurisation than appears to be possible with soda ash in siliceous lined ladles. Experiments on the use of basic linings with the sodium carbonate process.

17-6. **Factors Influencing Staining of Silica Brick.** *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 122, 124.

Tests demonstrated that staining of silica brick occurred in a critical temperature range of 900-1000° C.

17-7. **Refractory Service Conditions in Electric Steel Furnaces. I. Arc Furnaces.** *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 112, 114, 116, 118, 120.

Conditions to which commercial refractories are subjected in acid and basic electric furnaces. 2 main types of electric furnaces described. Methods of installation.

17-8. **The Maintenance of the Furnace Linings in Large Basic Open-Hearth Tilting Furnaces by the Use of Chrome Ore, Magnesite and Serpentine.** A. Jackson. *Engineers' Digest*, v. 1, no. 2, Jan. '44, p. 116.

Efforts to reduce the magnesite consumption, even at the expense of increasing the chrome ore, later to reduce the chrome ore as well as magnesite consumed, and finally to replace both of these materials to the greatest possible extent by substitutes.

17-9. **Carbon Refractories for Blast Furnaces.** Josef M. Robitschek. *Iron Age*, v. 153, no. 5, Feb. 3, '44, pp. 48-53.

The use of carbon refractories in the blast furnace has thus far been limited to European practice. Although initial cost of installation is high, their long life and the elimination of inner cooling plates among other benefits make carbon linings economical for use in the United States. Advantages of various carbon linings over the conventional firebrick are discussed in detail.

17-10. **Industrial Survey of Refractory Service Conditions in Electric Steel Furnaces.** *Industrial Heating*, v. 11, Feb. '44, pp. 274, 278, 280, 282, 284, 286, 288, 290.

Lengthy discussion of the conditions to which commercial refractories are subjected in acid and basic electric furnaces used in the manufacture of steel.

17-11. **The Syphon Brick Method of Cupola Tapping.** E. R. Dunning. *Foundry Trade Journal*, v. 71, Dec. 30, '43, pp. 341-345.

Use of a syphon brick facilitates metal handling and slagging procedure.

17-12. **Lagging for Heat Conservation.** *Iron & Steel*, v. 17, Feb. '44, p. 254.

Theory and application of insulating materials.

17-13. **Conserve Vital Fuel by Insulating Bare Metal Surfaces.** *Industry & Power*, v. 46, March '44, pp. 72-75.

Methods of calculating and reducing preventable heat losses are illustrated by typical examples of savings derived from insulating feedwater heaters, hot storage tanks, boiler drum heads, piping, and fittings with mineral wool insulation. Other types of insulation will produce similar savings.

17-14. **Industrial Survey of Refractory Service Conditions in Electric Steel Furnaces.** *Industrial Heating*, v. 11, March '44, pp. 448, 452, 454.

Design and operational details relative to electric furnaces which affect the life in service of refractories used in their lining and construction. The two main types of electric furnaces in common use for the manufacture of steel are described, along with their auxiliaries. Methods of installation of refractories for this service are also discussed.

17-15. **The Selection of Blast-Furnace Refractories.** Hobart M. Kraner and E. B. Snyder. *Metals Technology*, v. 11, April '44, Tech. Pub. 1727, 12 pp.

Volume stability, low porosity and decreased pyroplasticity are desirable for blast-furnace linings, particularly for the hearth. A hot load test is a valuable

means of testing the fusion or softening behavior of a refractory at operating temperatures. The effect of carbon monoxide on commercial blast-furnace refractories in their as-received condition and after refiring is reported, showing that many commercial blast-furnace refractories disintegrate badly but that refiring decreases the effect and certain special refractories are now available which are almost free of the tendency.

17-16. **Mycalex.** Lawrence E. Barringer. *General Electric Review,* v. 47, April '44, pp. 53-55.

Mycalex insulation serves in a wide variety of applications; with the insulating advantages of ceramics, it is mechanically strong yet readily machinable; can be punched, compression molded, injection molded. or fabricated.

17-17. **Production Results with a Basic Lined Cupola.** C. Heiken. *Foundry Trade Journal,* v. 72, March 2, '44, pp. 185-187, 190.

High silicon losses, heavy lining deterioration, high carbon content.

17-18. **Direct-Arc Electric Furnace Refractories.** E. K. Pryor. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 878-896.

Various causes of refractory failures and shows the application of refractory products to direct-arc electric furnace practices. Properties of refractories and their relation to furnace operating conditions are discussed. Methods of furnace lining design and construction are presented. Necessity of proper design of door arches, jambs and roofs, and the selection of proper refractories for these points is particularly stressed. Performance of masonry type linings and monolithic linings of the sillimanite type is shown.

17-19. **Redesign Increases Cyanide Pot Life.** J. H. Greenberg. *Metal Progress,* v. 45, May '44, pp. 912-913.

Ferritrol 19C paint applied and baked into outside of pot, changing oil-fired burner to gas-fired and redesigning inside of pot, increases life from 600 to 1200 heat hours to 3000 to 4000.

17-20. **Thermobloc Recuperators and Heat Exchangers.** *Metallurgia,* v. 29, March '44, pp. 261-263.

Development of alloy steels, capable of withstanding relatively high temperatures, has facilitated the use of metallic recuperators and heat exchangers, but limitations have been imposed by their initial high cost. Incandescent Heat Co., Ltd., has developed an efficient type of metallic recuperator of small bulk and low first cost, known as the Patent Incandescent Thermobloc, which can be applied to a wide range of heating problems.

17-21. **Low Loss Ceramics.** R. Russell, Jr. and L. J. Berberich. *Electronics,* v. 17, May '44, pp. 136-142, 338.

Zircon porcelains widely used as insulation where ability to withstand heat-shock is important, such as in spark-plugs, have been developed for high-frequency use. Properties of such porcelains and of steatites, ultra-steatites, high-tension porcelain and transparent

fused quartz are given. Test methods are described. 10 ref.

17-22. **Steel Plant Refractory Problems.** *Industrial Heating,* v. 11, May '44, pp. 794, 798, 800.

Problems encountered in the application and maintenance of refractories used in steel plants. Life of silica brick roofs used on open-hearth furnaces could be increased appreciably by the application of roof temperature control.

17-23. **Report of Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys.** American Society for Testing Materials, Preprint 15, June '44, 19 pp.

Tentative specifications for chromium-nickel-iron alloy castings for high temperature service for electric furnaces (B-44-T); test for equivalent yield stress of thermostat metals; tentative specifications for drawn or rolled alloys, 80% Ni, 20% Cr, for electrical heating elements (B82-T); and drawn or rolled alloys 60% Ni, 16% Cr, and balance Fe, for electrical heating elements (B83-T).

17-24. **First Report on the Basic Cupola by the Melting Furnaces Sub-Committee.** Institute of British Foundrymen, Advance Copy, Paper No. 803, 41st Annual Meeting, June 10, '44, 10 pp.

Previous work, use of stabilized dolomite as a lining and patching material, installation of the monolith, drying, patching, lining life, improving the life of stabilized dolomite linings, basic brick linings, desulphurization, preliminary melts with pig-iron, dephosphorization of steel scrap, wrought iron and pig-iron charges, lining wear, proposed lines for investigation, applications of the basic cupola.

17-25. **Basic Refractories for the Copper Industry—I.** R. P. Heuer and A. E. Fitzgerald. *Metals & Alloys,* v. 19, May '44, pp. 1133-1136.

Development and progressively increasing use of basic refractories for copper reverberatory furnaces. 14 ref.

17-26. **Alumino-Silicate Refractories.** J. H. Chesters. *Iron Age,* v. 153, June 8, '44, pp. 48-53.

Chemical composition, physical structure, properties and world distribution.

17-27. **Reaction of Copper Reverberatory Slag on Different Refractories.** S. S. Kocatopcu. Thesis for M.Sc. Degree, Massachusetts Institute of Technology, 1944.

17-28. **Alumino-Silicate Refractories.** J. H. Chesters. *Iron Age,* v. 153, June 15, '44, pp. 79-85.

Manufacture, properties, such as thermal expansion, torsion tests, spalling and slag resistance and applications in steel plants. 105 ref.

17-29. **The Sillimanite Group of Minerals for High-Temperature Refractories.** *Industrial Heating,* v. 11, June '44, p. 962.

The occurrence, properties and uses of the minerals kyanite, andalusite, sillimanite, and dumortierite, and the allied minerals topaz and pinite, in the manufac-

ture of refractories that must withstand the high temperatures met with in numerous modern processes.

17-30. **The Comparative Strengths of Ceramic and Other Insulating Materials.** E. Rosenthal. *Electronic Engineering,* v. 16, May '44, pp. 505-507.

A resume of the more important electrical and mechanical characteristics of ceramics compared with those of other types of insulators.

17-31. **Basic Refractories for the Copper Industry.** R. P. Heurer and A. E. Fitzgerald. II. *Metals & Alloys,* v. 19, June '44, pp. 1405-1408.

Basic converters.

17-32. **Simple Method for Measuring Industrial Furnace Heat Losses.** *Brick & Clay Record,* v. 105, July '44, pp. 42, 44, 46.

Charts simplify solution of heat transfer problems. All types of refractories can be studied. Conductivity factor must be known.

17-33. **Rationalizing Thermal - Insulation Dimensions.** Ray Thomas. *Mechanical Engineering,* v. 66, July '44, pp. 480-481.

Some advantages of having a simple, direct, and definite scheme with which to design and order pipe insulation.

17-34. **Basic-Lined Ladles.** N. L. Evans. *Iron & Steel,* v. 17, May 18, '44, pp. 409-412.

Use in the desulphurization of cast iron by sodium carbonate.

17-35. **Refractories.** Louis A. Smith. *Iron and Steel,* v. 17, June '44, pp. 491-493.

Steel plant problems of 1943 discussed.

17-36. **Use of Permeable Refractories for Furnace Construction.** R. H. Anderson, D. C. Gunn and A. L. Roberts. *Metallurgia,* v. 30, May '44, pp. 37, 38, 39, 40.

The use of permeable characteristics of refractories in order to increase furnace efficiency. Results of experimental work in a recent paper before the Institute of Fuel.

17-37. **Getting the Most Out of Electric Steel Furnace Electrodes.** R. L. Baldwin. *Metals & Alloys,* v. 20, July '44, pp. 62-67.

Handling methods, joint-assembly techniques, electrical conditions, operating practices.

17-38. **Basic Refractories for the Copper Industry. III.** R. P. Heuer and A. E. Fitzgerald. *Metals & Alloys,* v. 20, July '44, pp. 68-72.

Refining furnaces — General construction; bottom construction; providing for expansion; basic roofs for intermittent operation.

17-39. **Carbon Refractories Meet Severe Temperature Conditions.** *Brick and Clay Record,* v. 105, August '44, pp. 40-42.

Material is easily molded into any size or shape unit, can be further fabricated on the construction job; special properties for special uses of these refractories.

17-40. **Application of Metallic Recuperators.** John H. Loux. *Steel,* v. 115, August 21, '44, pp. 118-120.

Reducing temperature of flue gases to 1700° F. by diluting them with air from two points practically eliminates all maintenance of recuperators and assures satisfactory life of elements; greater turbulence is secured by the addition of more cast needles; data covering skelp, bath and rotary-hearth furnaces.

17-41. **Developments in Insulating Materials.** T. F. Wall. *Engineering,* v. 157, June 23, '44, pp. 482-483.

Study of properties to ascertain how they may best be manufactured.

17-42. **Determining the Quality of Silica Brick.** Frank G. Norris. *Industrial Heating,* v. 11, August '44, pp. 1316, 1318.

A report of typical results being derived from a scientific study of refractory problems.

17-43. **Foundry Applications of High-Temperature Heat Insulation.** *Industrial Heating,* v. 11, August '44, pp. 1328-1329.

Insulating refractory materials, including firebrick.

17-44. **Arc Furnace Refractories.** Norman F. Dufty. *West Scotland Iron & Steel Institute Journal,* v. 51, 1943-44, no. 3, pp. 35-42.

Best bricks to use for various parts of the furnace, considering costs and availability.

17-45. **Insulation of Steel Plant Equipment.** J. H. Chesters. *Iron Age,* v. 154, August 24, '44, pp. 42-49.

Insulation of the steel plant from the point of view of its optimum use and available materials, their characteristics and special applications.

17-46. **Permeable Refractories in Furnace Construction.** *Engineering,* v. 157, June 23, '44, p. 499.

A new principle in gas-fired furnace design, involving the use of permeable insulating refractories through which the furnace gases are withdrawn from the combustion chamber.

17-47. **Open-Hearth Refractory and Masonry Problems Discussed at Conference. II.** *Industrial Heating,* v. 11, August '44, pp. 1320, 1322, 1324, 1326.

Present service life of refractories compared with that of former periods of less sustained operation, and new developments in the field of refractories for open hearth use.

17-48. **Insulation of Steel Plant Equipment.** J. H. Chesters. *Iron Age,* v. 154, August 31, '44, pp. 47-52, 90.

Insulating cements, concrete and coatings discussed. Explanation of the meaning of thermal conductivity and the factors influencing it are given as well as methods for its computation. 101 ref.

17-49. **Pure Oxide Refractories.** D. Kirby. *Metallurgia,* v. 30, June '44, pp. 65-69.

Various kinds of pure oxide refractories discussed and particulars given of their applications and properties.

17-50. **Beryllium Oxide.** L. David. *Metallurgia,* v. 30, June '44, pp. 91-93.

Use and properties discussed briefly; mesh size; production of crucibles and accessory parts. 14 ref.

17-51. **Basic Lined Cupola.** *Foundry,* v. 72, Sept. '44, pp. 118, 121, 124, 126.

Improvements in basic refractories and development of a basic patching material.

17-52. **Gas-Fired Furnaces.** *Iron and Steel,* v. 17, July '44, p. 546.

Permeable refractories eliminate flues and increase thermal efficiency.

17-53. **Properties of Enamel Slips: I, General Properties of Clays and Enamel Slips.** Burnham W. King, Herbert D. Carter, and Harry C. Draker. American Ceramic Society *Journal,* v. 27, Sept. 1, '44, pp. 253-260.

Five clays used to suspend porcelain enamels and their properties were studied.

17-54. **Substitution of Topaz, Domestic Kyanite, and Synthetic Mullite-Corundum for India Kyanite. IV, Raw Topaz as High-Temperature Bond for Domestic Kyanite.** T. N. McVay, W. W. Galbreath, and Dan Allen. American Ceramic Society *Journal,* v. 27, Sept. 1, '44, pp. 275-282.

Raw topaz has been found to act as a high-temperature bond for both raw and calcined kyanite. It is thought that this bonding action is due in part to volatiles which emerge from the raw topaz between 1000° and 1200° C. Some of the topaz decomposition products are absorbed and retained by the calcined kyanite.

17-55. **Permeable Refractories for Gas Fired Furnaces.** *Iron Age,* v. 154, Sept. 7, '44, pp. 72, 154, 156, 158.

The use of permeable refractories through which furnace gases are withdrawn from the furnace chamber.

17-56. **Recent Advancements in Industrial Heating Processes and Equipment. III.** *Industrial Heating,* v. 11, Sept. '44, pp. 1420, 1422, 1424, 1426, 1428, 1450.

The rate of heat absorption by steel in normal furnace operation, an ingenious proportional-mixer-type kiln, carbo-nitriding and improvements in the high-temperature heat treatment of ferrous metals by high-frequency induction.

17-57. **Industrial Survey of Refractory Service Conditions in Electric Steel Furnaces. IV.** *Industrial Heating,* v. 11, Sept. '44, pp. 1500, 1502, 1504, 1506, 1508, 1510, 1512.

The design and operation of electric steel-making furnaces, with especial reference to the effect of these factors on the service life of refractories employed in their construction.

17-58. **Value of Tests on Refractories.** Stuart M. Phelps. American Ceramic Society *Bulletin,* v. 23, Sept. 15, '44, pp. 310-315.

Significance of test data on refractories as related to the manufacture and use of the product discussed. Mention is made of the precautions which should be observed in obtaining samples, conducting tests, and the interpretation of the data. The way in which reliable test results can be used in product control and development by the manufacturer is brought out.

17-59. **Testing Refractories from the Standpoint of Research.** Fred A. Harvey. American Ceramic Society *Bulletin,* v. 23, Sept. 15, '44, pp. 315-317.

Development of new products depends upon the development of testing methods. 7 ref.

17-60. **Significance of Steel-Plant Refractories Testing Program.** W. S. Debenham. American Ceramic Society *Bulletin,* v. 23, Sept. 15, '44, pp. 317-320.

Activities and aims of a steel-plant refractories testing program and of the several factors that either favorably or adversely affect the significance of such work. Knowledge of service conditions and the necessity for their correlation with laboratory tests is stressed, and the suitability of some standard tests discussed.

17-61. **Furnace Construction.** R. H. Anderson, D. C. Gunn and A. L. Roberts. *Iron & Steel,* v. 17, August '44, pp. 591-594.

Uses of permeable refractories in new heating units.

17-62. **Dehydration and Oxygen Enrichment of Blast-Furnace Air.** J. B. Fortune. *Metallurgia,* v. 30, July '44, pp. 152-158.

60% by weight of materials entering the blast-furnace is air. There is something to be said for conditioning the burden charged; it seems desirable that the blast should be conditioned. Air always contains moisture decomposed in an endothermic reaction, so the heat absorbed by the moisture content of the blast may affect the operation of the furnace, but do savings affected by using dried air justify additional cost of plant involved? Cheap oxygen may provide economical means.

17-63. **Metallic Furnace Hearths.** *Automobile Engineer,* v. 34, July '44, p. 278.

New development by the Incandescent Heat Co., Ltd.

17-64. **Conversion of Certain Refractory Oxides to a Suboxide Form at High Temperatures.** C. A. Zapffe. American Ceramic Society *Journal,* v. 27, Oct. 1, '44, pp. 293-298.

Suboxide forms of SiO, TiO, ZrO, CrO, AlO, BO, VO, and CbO. The role of these suboxides in the service and failure of refractories and in the chemistry of slags.

17-65. **Furnace Construction.** R. H. Anderson, D. C. Gunn and A. L. Roberts. *Iron & Steel,* v. 17, Sept. '44, pp. 627-630.

Uses of permeable refractories in new heating units.

17-66. **Non-Metallic Fixtures Conserve Energy in Induction Heating.** Frank W. Curtis. *American Machinist,* v. 88, Oct. 12, '44, pp. 101-104.

Alone, or in combination with metal parts, asbestos board can be used to make economical work holding fixtures for all types of induction heating for joining and localized hardening.

17-67. **A Color-Temperature Scale: Part II.** W. E. Forsythe and E. Q. Adams. *General Electric Review,* v. 47, Oct. '44, pp. 59-62.

Color temperature and characteristics of various popular lamps.

17-68. **The Basic-Lined Cupola.** *Engineering,* v. 158, Sept. 22, '44, p. 225.

The development of a basic patching material.

17-69. **Special Loading Fixtures Add to Furnace Capacity and Operating Economy.** Paul Goetcheus. *Industrial Heating,* v. 11, Oct. '44, pp. 1639-1640, 1642, 1644, 1646.

Furnace parts, roller rails, conveyor rolls and chains, carburizing and annealing boxes, nitriding fixtures, dipping baskets, cyanide and lead pots—these are only a few of the locations where the use of heat resisting alloys has resulted in important economies and increased production.

17-70. **The Design, Selection and Application of Alloy Pots for Liquid Heat-Treating Media.** Harrison I. Dixon. *Industrial Heating,* v. 11, Oct. '44, pp. 1648, 1650, 1652-1654, 1658.

The alloy manufacturer should know the type of furnace, fuel, combustion conditions, type of work handled, and method of handling employed for a given process.

17-71. **The Sillimanite Group of Minerals for High-Temperature Refractories, II.** *Industrial Heating,* **v. 11,** Oct. '44, pp. 1699-1700.

The occurrence, properties and uses of the minerals kyanite, andalusite, sillimanite, and dumortierite, and the allied minerals topaz and pinite, in the manufacture of refractories that must withstand the high temperatures met with in modern processes.

17-72. **The Basic-Lined Cupola.** *Engineering,* v. 158, Oct. 6, '44, p. 265.

Linings, types, life, costs.

17-73. **Permeable Refractories for Furnaces.** D. C. Gunn. *Industrial Gas,* v. 23, Nov. '44, pp. 11, 28-29.

Fireclay insulating material which is burnt with carbonaceous material; on firing, the carbonaceous material burns out, and leaves a porous structure, resulting in a brick possessing low thermal conductivity and low thermal capacity.

17-74. **Economic Thickness of Thermal Insulation for Intermittent Operation.** C. B. Bradley, C. E. Ernst and V. Paschkis. *Industrial Heating,* v. 11, Dec. '44, pp. 2070, 2072, 2074, 2076, 2078, 2080, 2082.

Economic thickness of thermal insulation for intermittent operation, defined as thickness yielding the smallest sum of cost of heat loss and fixed cost of insulation. Method based upon the electrical analogy method.

17-75. **Refractory Practice in Malleable Air Furnaces.** Ray A. Witchey. *Brick & Clay Record,* v. 105, Dec. '44, pp. 29-32, 34, 36.

Choice of refractories is made subject to qualification by operating conditions. Furnace operation is reviewed to clarify reasons for choice of refractories.

SECTION XVIII

HEAT TREATMENT

18-1. **Sub-Zero Refrigeration.** G. B. Berlien. *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 99, 101-102, 104.

Tool life and performance are improved through incorporation of a refrigeration cycle in the heat-treating process. Results and methods of sub-zero treatments on various alloys and metal-cutting applications.

18-2. **Heat Treating Wrought Aluminum Alloys.** *Steel Processing,* v. 29, no. 12, Dec. '43, pp. 639-644, 647, 654.

Heat treating to increase strength of Al alloys, 24S, 24S-O, 24S-T.

18-3. **Induction Heat Treating.** *Steel Processing,* v. 29, no. 12, Dec. '43, pp. 645-646, 648.

Half-trac sprocket hardening; tank transmission parts; bomb casings.

18-4. **Continuous Cooling Transformation Diagram, from Modified End-Quench Method.** C. A. Liedholm. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 94-99.

Jominy end-quench bars used to predict the structure and hardness of a steel when cooled in normal quenches. These data are used to decide whether a heat can be die-quenched in the regular routine.

18-5. **Progress in the Heat Treatment of Cast Iron.** J. S. Vanick. *Iron & Steel,* v. 17, no. 4, Dec. '43, pp. 203-206.

Difficulties encountered, stress relief, aging, gassy iron, machinability, and wear.

18-6. **There Is No Substitute for Good Heat Treatment.** A. S. Eves. *Modern Machine Shop,* v. 16, no. 8, Jan. '44, pp. 160-184.

Different methods of heat treating and hardening and various factors contributing to good results. Good design essential.

18-7. **Heat Treating Machine Gun Links.** John Ade. *Metals and Alloys,* v. 18, no. 6, Dec. '43, pp. 1339-1341.

Continuous clean-hardening and tempering furnace lines, details of mechanization, furnace construction, controls, quenching unit, draw-furnace recirculating equipment.

18-8. **Induction Hardening.** T. E. Eagen. *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 76-78.

Cuts heat treating time in half in production of diesel engine parts; originally planned for only 35 parts,

application has been so successful that process is now used on more than 158 items.

18-9. **Sub-Zero Hardening Cycles.** G. B. Berlien. *Steel,* v. 114, no. 2, Jan. 10, '44, pp. 86-90.

A more completely heat treated structure may be obtained by subjecting the work to sub-zero temperatures following conventional heating and cooling methods. Physical characteristics of most steels may be definitely improved through further decomposition of austenitic structure at low temperatures.

18-10. **Sodium Cyanide for Carburizing.** L. G. Whybrow Palethorpe. *Chemical Age,* v. 49, no. 1271, Nov. 6, '43, pp. 469-473.

Media, cyanide process, case composition and selective carburization. 2 ref.

18-11. **Modern Heat Treating Takes a Lot of Know-How.** A. S. Eves. *Iron Age,* v. 153, no. 2, Jan. 13, '44, pp. 62-63.

Summarizes the tried and untried proprietary and non-proprietary methods of heat treatment that have been introduced in recent years.

18-12. **Difficulties Encountered in the Heat-Treatment of Drop Forgings.** Bernard Thomas. *Metallurgia,* v. 29, no. 169, Nov. '43, pp. 11-14.

Heat-treatment begins with the heating of the steel preparatory to forging, and concludes with the final cooling, followed by the last heat-treatment operation. Heat-treatment difficulties.

18-13. **Coil Design for Successful Induction Heating.** Frank W. Curtis. *American Machinist,* v. 87, no. 26, Dec. 23, '43, pp. 94-96.

Details of solid-type induction coils arranged for single or multiple operation.

18-14. **Thin Case Hardening with Radio-Frequency Energy.** V. W. Sherman. *Electronic Engineering,* v. 16, no. 189, p. 229.

Induction heat-treating in the 1-20 megacycle frequency range.

18-15. **Pressure Quenching.** Metallurgicus. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 88-89.

Methods of quenching by means of oil jets, excellent for shafts, pins, broaches, and other long, straight pieces.

18-16. **Pittsburgh Commercial Heat Treating Plant Processes Ferrous and Non-Ferrous Metals.** A. M. Cox. *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 129-132, 134, 136-137, 140.

Types of furnaces used in the plant briefly described.

18-17. **Case Hardening by Induction Heating.** Vernon W. Sherman. *Canadian Metals & Metallurgical Industries,* v. 7, Dec. '44, pp. 34-36.

Thin case hardening; advantages of megacycle heat treatment; applications. 4 ref.

18-18. **Controlled Gas Carburizing and Diffusion Cycles.** F. E. Harris. *Steel Processing,* v. 30, no. 1, Jan. '44, pp. 47-49.

The factors affecting the rate of carbon addition and the effects of these rates on the carbon gradient. The

factors discussed are: Steel analysis, temperature of carburization, elapsed time and gas composition in the carburizing chamber.

18-19. **Characteristics and Applications of Controlled Atmospheres for Heat Treating.** C. E. Peck. *Steel Processing,* v. 30, no. 1, Jan. '44, pp. 50-51.
The combustion properties of fuel gas for controlled atmosphere heat treating.

18-20. **Heat Treatment and Aging of 24S Aluminum Alloys.** Max E. Tatman and Ray A. Miller. *Iron Age,* v. 153, no. 4, Jan. 27, '44, pp. 50-55.
Tests on 24S clad aluminum alloy sheets and 24S extrusions, undertaken by Consolidated Vultee Aircraft Corp., are summarized. These reports embrace investigations on aging at temperatures from 325 deg. to 400 deg. F.; the effect of plastic deformation on aging characteristics and the degrees to which variations in deformation affect aging results; corrosion tests on aged alloys; and the effect of heat on mechanical properties and on color of protective coatings and camouflage finishes.

18-21. **Sub-Zero Unit on the Assembly Line.** *Iron Age,* v. 153, no. 4, Jan. 27, '44, p. 49.
Automatic feeding of steel valve inserts through a standard Deep-Freeze unit, by the Dodge Div. of Chrysler Corp. at its main plant in Detroit.

18-22. **"Pressure-Quench" Machine Minimizes Distortion of Quenched Armor Plate.** C. A. Maurer. *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 28, 30, 32, 34, 36.
Installation at Drever Co., Phila., Pa.

18-23. **Cycle Annealing.** Metallurgicus. *Metal Progress,* v. 45, no. 2, pp. 295-296.
General discussion of principles and application.

18-24. **Rapid Hardening of Sprockets.** S. Covert. *Metal Progress,* v. 45, no. 2, p. 297.
An automatic fixture for use with induction unit for hardening teeth on drive sprockets for half-trac combat vehicles at a saving of more than half the time formerly used.

18-25. **Heat Treatment of Magnesium Alloys.** C. E. Nelson. *Light Metal Age,* v. 2, Jan. '44, pp. 17, 30, 32, 34.
Solution, aging, and stabilizing heat treatments for magnesium alloys.

18-26. **Isothermal Quench Baths Applied to Commercial Practice.** Harold J. Babcock.. *Iron Age,* v. 153, no. 5, Feb. 3, '44, pp. 44-47.
Time-temperature-transformation curves can be invaluable aids in improving physical properties of steel products. Information obtainable from equilibrium diagrams and TTT curves compared. Isothermal transformation curves of several carbon and alloy steels are examined.

18-27. **Hole Quenching Stops Breakage of 40-mm. Cartridge Die Rings.** Wilton F. Hoag. *American Machinist,* v. 88, no. 3, Feb. 3, '44, pp. 115-116.
Up to 100,000 impressions made with header die rings

quenched in special fixture. Tangential compression offsets loading and unloading reactions of process.

18-28. **Isothermal Quench Bath Applied to Commercial Practice.** Harold J. Babcock. *Iron Age,* v. 153, no. 6, Feb. 10, '44, pp. 62-69.

Description of equipment and treatment used in industrial applications. Importance of the molten salt quench bath is stressed and comparisons with other quenching media. 15 ref.

18-29. **Applying Prepared Atmospheres to Metal Processing.** E. G. de Coriolis. *Mechanical Engineering,* v. 66, Feb. '44, pp. 111-114.

Preparation of atmospheres, functional utility, furnace construction, types of equipment, Bell annealer, operation. 6 ref.

18-30. **Heat Treatment of Medium Carbon Cast Steel in Moderately Heavy Sections.** K. L. Clark, H. F. Bishop, and H. F. Taylor. *American Foundrymen's Association Transactions,* v. 51, no. 3, March, '44, pp. 617-646.

Six 10 x 10 x 20-in. castings and 6 each of 2 types of test coupons were cast of approximately 0.25% carbon steel. These castings and coupons were subjected to various heat treatments designed to shorten the annealing treatment sometimes applied to moderately heavy steel castings of this approximate chemical composition. Savings in heat treating time were achieved by accelerating heating rates, by reducing soaking periods, and by utilizing air cooling and quenching. Physical properties were improved rather than harmed.

18-31. **To Heat Treat in or Out?** A. S. Eves. *American Machinist,* v. 88, no. 4, Feb. 17, '44, pp. 97-98.

Can you afford to do a first class heat treating job in your plant, or should the work be sent to an expert commercial shop? Fill out these forms and check the costs against outside quotations.

18-32. **Applying Prepared Atmospheres to Metal Processsing.** E. G. de Coriolis. *Mechanical Engineering,* v. 66, no. 2, Feb. '44, pp. 111-114.

Preparation of atmospheres; atmosphere-furnace construction; operation of bell annealer. 6 ref.

18-33. **Heat Treating "Moly" High Speed Steel.** Francis A. Spencer. *Tool Engineer,* v. 13, Feb. '44, p. 85.

Heat-treating procedure.

18-34. **The Treatment of Materials by the Deep-Freeze Process.** E. Gregory. *Machinery (London),* v. 64, Jan. 13, '44, pp. 32-33.

Applications of the Deep-Freeze process. Heat treatment, stabilization of precision tools, apparatus.

18-35. **Progress in the Heat Treatment of Cast Iron.** J. S. Vanick. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 235-238.

Tests and results of treating cast iron. 10 ref.

18-36. **Cold Water Spray Quench.** V. S. Sorenson and F. O. Riek. *Iron Age,* v. 153, no. 7, Feb. 17, '44, pp. 60-63.

Quenching method in which a dense fog is used rather than a spray results in corrosion-free material, and eliminates much distortion trouble. Uniformity of

quenching, which compares favorably with that of an immersion quench, is obtained.

18-37. **Nitriding.** L. G. Whybrow Palethorpe. *Chemical Age,* v. 50, Jan. 1, '44, pp. 11-14.

Case-hardening steels with nitrogen.

18-38. **Induction Hardening and Brazing.** W. S. Craig. *Canadian Metals & Metallurgical Industries,* v. 7, Feb. '44, pp. 22-24.

Principles and applications.

18-39. **Hardening and Brazing in Tocco Unit.** *Iron Age,* v. 153, Feb. 24, '44, p. 75.

"Three-in-one" heat treating operation made possible by change in design. Effects saving in steel and relieves forging facilities.

18-40. **Sal-Way Steel Treating Co. Employs Salt Bath Furnaces Exclusively.** *Industrial Heating,* v. 11, Feb. '44, pp. 292, 294, 296.

Description of the Sal-Way Steel Treating Co. processes, which specialize in the heat treatment of tools, dies, and intricate parts for aircraft made of alloy steel.

18-41. **Controlled Atmospheres for Heat Treating.** C. E. Peck. *Steel Processing,* v. 30, Feb. '44, pp. 111-113.

Method of obtaining various gases and their applications in heat treating operations.

18-42. **Heat Treating Beryllium Copper.** Wayne Martin. *Iron Age,* v. 153, Feb. 24, '44, pp. 66-71.

Properties of Be-Cu depend to a large extent on its proper heat treatment. Effects of solution anneal and precipitation hardening on physical properties and microstructure of the alloy discussed. Advantage of ternary over binary alloys evaluated.

18-43. **Martensite Reactions in Alloy Steels.** *Industrial Heating,* v. 11, Feb. '44, pp. 248, 250.

Discussion of the results of the Greninger-Troiano quench-temper procedure.

18-44. **Ordnance Flame Hardening.** Stephen Smith. *Canadian Metals & Metallurgical Industries,* v. 7, Feb. '44, pp. 24-28.

Applications in U. S. program.

18-45. **The Sulphur Content of Carburizing Compounds in Electric Carburizing Furnace Operation.** K. Wohlgemuth. *Engineers' Digest,* v. 1, Feb. '44, pp. 167-168.

Effects of the sulphur contents of the carburizing compounds upon the electrical heating elements.

18-46. **Notes on the Heat Treatment of Gray Cast Iron.** M. Bader. *Engineers' Digest,* v. 1, Feb. '44, pp. 165-167.

Discussion of the most commonly applied methods of heat treatment: Stress-relief anneal; soft anneal; hardening and tempering; salt-bath hardening; and surface hardening with the oxy-acetylene torch.

18-47. **Heat Treating Bronze Castings.** J. W. Horner and Frank A. Mason. *Foundry,* v. 72, March '44, pp. 109, 187-189.

Heat treatment to cure porosity is applicable only to a certain condition of the metal structure.

18-49. The Hardening Quench. E. Simister. *Metallurgia,* v. 29, Jan. '44, pp. 115-118.

The theory of quenching and various media employed, with their advantages and disadvantages.

18-50. Heat Treating Cast Iron. J. Edmiston. *Metallurgia,* v. 29, Jan. '44, pp. 138-140.

Iron castings can be made to possess properties that render them capable of withstanding a considerable variety of severe service conditions. When properly produced, under controlled conditions, iron castings can be substantially improved and modern high-duty types react to suitable heat treatment cycles.

18-51. Modern Practice in Surface Hardening. *Metal Progress,* v. 45, March '44, pp. 484-496.

Six brief talks presented at one of the A.S.M. Group Meetings at the October Convention. Covers gas carburizing, hard layers on tool steels, differential hardening.

18-52. Controlled Gas Carburizing and Diffusion Cycles. Floyd E. Harris. *Metal Progress,* v. 45, March '44, pp. 484-486.

Discusses steel analysis; temperature of carburization, elapsed time, composition of gas within the carburizing chamber, rationale of gas usage, diffusion period.

18-53. Supposed "Graphite" in Carburized Cases. John Welchner. *Metal Progress,* v. 45, March '44, pp. 486-487.

Barium energized material produces a much greater grain boundary attack than the calcium energized. Grain boundary substances were formed during the time at carburizing temperature, and were unaffected by the method of cooling. Steel analyses showed that no grain boundary constituent could be produced. Si and Al either promoted graphitization or themselves entered into a chemical reaction during carburizing.

18-54. Utility of the Hardenability Test on Steels for Carburizing. O. W. McMullan. *Metal Progress,* v. 45, March '44, pp. 490-492.

Case and core considered separately in connection with Jominy end-quench test.

18-55. Differential Hardening with High Frequency Current. F. F. Vaughn. *Metal Progress,* v. 45, March '44, pp. 493-494.

Brief statement of principles; frequencies and equipment used; control. Method can be used to harden carbon steel parts with extreme rapidity; alloy content not necessary. Applications to production parts.

18-56. Putting Flame Hardening to Work. Gordon T. Williams. *Metal Progress,* v. 45, March '44, pp. 494-496.

Applications, hardenable materials, methods, equipment, costs and limitations.

18-57. Amount of Martensite in Quenched Steel Influences Properties After Tempering. Benjamin F. Shepherd. *Metal Progress,* v. 45, March '44, pp. 503-507.

A chart correlating Jominy end-quench data with cooling speeds, surface and center, for specific quenching conditions, the size of bar that can be completely hardened, and its utility.

18-58. **Cycle Annealing.** Metallurgicus. *Metal Progress,* v. 45, March '44, pp. 508-509.

Description of annealing cycle, cycle and full annealing compared; operation in batch furnaces.

18-59. **Keep Water Out of Fast Quenching Oils.** George R. Pease. *Metal Progress,* v. 45, March '44, pp. 511-512.

A few tenths of a per cent of water, finely dispersed in a normally "fast" oil, so reduced the initial quenching speed of the oil that it no longer quenched satisfactorily. Tests results on different oils.

18-60. **Speeding Heat Treatment of Aluminum Alloys.** S. G. Andrews. *Iron Age,* v. 153, March 9, '44, p. 65.

Soaking time for heat treatment of clad aluminum alloys which is longer than necessary reduces the productive capacity of the ovens and causes diffusion of the copper into the aluminum alclad, and surface blisters.

18-61. **Flame Hardening Aircraft Gears.** *Iron Age,* v. 153, March 9, '44, pp. 66-67.

Fabrication of gears for retractable landing devices on Army P-39 Airacobras, built by the Bell Aircraft Corp., Buffalo, N. Y., includes a flame-hardening process on gear teeth that permits close control of gear teeth hardness and better quality of the finished product.

18-62. **Tool Design Principles Apply to Induction Heating.** Frank W. Curtis. *American Machinist,* v. 88, March 16, '44, pp. 91-93.

Fixtures must be devised so they will not be subjected to excessive heating by the high frequency current applied to the workpiece.

18-63. **Heating Gears for Hardening by High-Frequency Induction.** Frank W. Curtis. *Machinery* (London), v. 64, Feb. 3, '44, pp. 119-124.

Induction heating permits exceptionally fast heating, comparatively low operating cost and uniform results.

18-64. **Secondary Hardening of High-Speed Steel Cutting Tools.** John Garland. *Machinery* (London), v. 64, Jan. 27, '44, pp. 91-94.

Interrupted quenching, primary hardening, secondary hardening, testing for secondary hardness, and testing procedure.

18-65. **Induction Heating Serves to Speed Production.** M. P. Vore. *Product Engineering,* v. 15, March '44, pp. 182-184.

Basic principles of induction heating and the advantages of its use, including data on typical applications. Depth of penetration, frequency requirements and proper proportioning of heating coils are outlined.

18-66. **Increasing Life of High-Speed Steel Tools by Nitriding.** *Machinery,* v. 50, no. 7, March 44, pp. 170-175.

Current practice in applying two nitriding processes to high speed steel tool case hardening—the Holden Hy-Speed Case Treatment outlined by General Committee on Metallurgy of General Electric Co., and the "Maxi" process developed by Greenfield Tap & Die Corp.

18-67. **Spin Flame Hardening of Ball Races.** R. Gilson. *Industry and Welding*, v. 17, no. 3, March '44, pp. 42-45.

Rough machining, followed by heat treatment at 1575°, quenched in oil and air drawn at 1100° F. Internal wall of barrel is broached and flame hardened.

18-68. **Advanced Heat Treating Techniques.** Robert C. Gibbons. *Steel*, v. 114, March 27, '44, pp. 82-83, 124, 126.

Use of controlled atmosphere continuous furnaces and specially developed induction hardening coils.

18-69. **Some Effects of Sub-Zero Cooling on the Tempering of High Speed Steel.** G. A. Roberts and J. P. Gill. *Iron Age*, v. 153, March 23, '44, pp. 52-56.

Great attention is now being given to the application of sub-atmospheric treatment of metals, particularly high speed steel. The authors review past work and give data on recent experiments indicating that this treatment has very important commercial applications that will become prominent within the next several years. 4 ref.

18-70. **The Application of Hardenability Tests to Carburizing Steels.** O. W. McMullan. *Industrial Heating*, v. 11, March '44, pp. 351-352, 354, 356, 358, 360.

General considerations, core properties, relationship between case and core, hardenability tests, hardenability limits, cooling rates, specification ranges, hardenability of case. 4 ref.

18-71. **Carburizing and Heat Treating Transmission Parts for Naval and Air Force Equipment.** *Industrial Heating*, v. 11, March '44, pp. 370, 372, 374.

Description of equipment built by Pacific Co., Detroit, in use at war plants.

18-72. **Heat Treatment Plant.** *Aircraft Production*, v. 6, March '44, pp. 122-124.

Recent developments in equipment for the aircraft industry.

18-73. **Salt Baths.** *Canadian Metals and Metallurgical Industries*, v. 7, March '44, p. 33.

Composition, operation and application to ferrous and non-ferrous metals.

18-74. **The Pressure Quench for Armour Plate.** Fred P. Peters. *Iron & Steel*, v. 17, March '44, pp. 207-310.

Removing distortion during hardening.

18-75. **Heat Treatment of Large Steel Forgings in Controlled Atmospheres.** O. E. Cullen. *Steel Processing*, v. 30, March '44, pp. 173-177.

Surface Combustion has installed a number of batch type furnaces equipped with gas-fired radiant tube heating elements for production heat treating of large forgings under careful atmosphere control.

18-76. **Controlled Atmospheres for Bright Hardening.** C. E. Peck. *Metals & Alloys*, v. 19, March '44, pp. 593-599.

Numerous atmospheres have been developed to prevent the scaling or decarburization of steel during heat treatment and thereby obviate subsequent expensive and time-consuming cleaning, pickling or grinding operations. Few have been successfully and broadly ap-

plicable to steels of widely varying carbon or alloy content or temperature conditions. The fields of use of some of the most useful varieties, with particular attention to separately prepared completely reacted fuel gas atmospheres. 2 ref.

18-77. **What's Ahead in Heat Treating?** *American Machinist,* v. 88, March 30, '44, pp. 83-92.

A preview of manufacturing techniques that will soon become common practice.

18-78. **"X" Constitutent Formed in Alloy Steel on Continuous Cooling.** Arthur R. Kommel. *Metal Progress,* v. 45, April '44, pp. 664-665.

C-Cr-Mo cast steel heat treated to simulate annealing and normalizing treatment.

18-79. **Maximum Carbon in Carburized Cases.** Floyd E. Harris. *Metal Progress,* v. 45, April, '44, pp. 683-686.

While extraordinarily high carbon films are sometimes found on carburized work, evidence is produced that this is an abnormal condition and that properly controlled furnace conditions give perfectly predictable carbons and carbon-penetrations.

18-80. **Coupling Methods for Induction Heating.** Wesley M. Roberds. *Electronic Industries,* v. 3, April '44, pp. 80-83, 174, 176, 178, 180, 182, 184, 186, 188, 190.

Design principles of output transformers and various types of energy applicators for special jobs.

18-81. **Boron as an Accelerator of Malleable Annealing.** Harry A. Schwartz. *Foundry,* v. 72, April '44, pp. 129, 182.

Effect of adding boron in amounts approximating 1% to white cast iron.

18-82. **Hardening NE 8745 Steel.** Donald E. Roda and Frank C. Brautigam. *Iron Age,* v. 153, April 6, '44, pp. 42-46.

NE 8745 steel hardens at a lower temperature than might be expected. Also, the correlation between the Rockwell hardness and microstructures is of general interest and shows that hardness values alone cannot be taken as an indication of complete hardening.

18-83. **Gas Quenching.** Wm. Lehrer. *Steel,* v. 114, April 10, '44, pp. 98-99, 134, 136, 138, 141.

Results produced by gas quenching SAE X-4130 are applicable to NE 8630 steel.

18-84. **Sub-Zero Treatment of High Speed Steels.** Stewart M. DePoy. *Iron Age,* v. 153, April 13, '44, pp. 52-55.

Important increases in tool life may be obtained regardless of how refrigeration is used, and if followed by a sufficient temper to relieve the tremendous internal strains caused by the process. It is believed that refrigeration of —100° F. or lower is necessary to produce marked change in high speed steel.

18-85. **Decarburizing-Annealing in Carbon Monoxide Carbon Dioxide Mixtures.** *Iron Age,* v. 153, April 13, '44, pp. 67.

Effect of wall thickness, annealing time and temperature, and gas composition, as well as that of the C con-

tent of the iron and the elements Mn, Ni, Cr, V and S, were studied.

18-86. **Decarburization Control with Nitrogen Gas Atmosphere in Alloy Steel Annealing.** Julius L. Kozma. *Wire & Wire Products,* v. 19, April '44, pp. 227-237, 262-264.

Use of nitrogen atmospheres for annealing high carbon and alloy rod and wire coils to hold decarburization to a minimum.

18-87. **Nitriding Ferroalloys.** Ralph H. and Dave Steinberg. *Metals & Alloys,* v. 19, April '44, p. 859.

Advantages of nitrogen-bearing ferrochromium for the production of high-nitrogen alloy or stainless steels. The authors, seeking a possible extension of this idea to alloying agents other than chromium, nitrided other ferroalloys and report the best temperatures and other conditions to use.

18-88. **Interpretation of Isothermal Transformation Diagrams for Steel.** *Industrial Heating,* v. 11, April '44, pp. 525-526, 528, 530, 532, 534, 536.

Describes how S-curves are developed, and their significance, and reproduces several of the curves.

18-89. **A Study of Quenched Gray Cast Irons—Microstructure and Hardness.** E. Jimeno and A. Modolell. *American Foundrymen's Association Transactions,* v. 51, June '44, pp. 897-925.

Hardening of steel has been studied and the following factors have been found to affect it: (1) Austenite composition, (2) amount, nature and distribution of insoluble particles in the austenite, (3) austenite grain size at the time of quenching, (4) size of specimen, and (5) the heat abstracting power of the quench. 8 ref.

18-90. **Sub-Zero Stabilizing of Steel Gages and Parts.** Harold A. Knight. *Metals & Alloys,* v. 19, March '44, pp. 610-614.

The stabilization of precision gages and machine parts is a cold-treating application which has recently received new prominence and a sharp expansion in use. These have come about through the development of mechanical refrigerators that go down to—150°F. Methods used to "season" gages and parts via sub-zero treatment.

18-91. **Yes—Deepfreezing Helps.** A. S. Eves. *Modern Machine Shop,* v. 16, April '44, pp. 162, 164, 166, 168, 170.

Some of the phenomena that have resulted from this treatment.

18-92. **Induction Heating Serves to Speed Production.** M. P. Vore. *Product Engineering,* v. 15, March '44, pp. 182-184.

Basic principles of induction heating and the advantages of its use, including data on typical applications. Depth of penetration, frequency requirements and proper proportioning of heating coils are outlined.

18-93. **Principles of Heat Treating of Steels.** T. F. O'Brien. *Steel Processing,* v. 30, April '44, pp. 225-227, 250.

Fundamental chemical and physical aspects of the science of heat treating; heat treatment of steel; aircraft steels, and the problem engendered by the national emergency and the critical shortage of materials.

18-94. **Aging and the Yield Point in Deep Drawing Steel Sheets.** J. R. Low, Jr., and M. Gensamer. *Steel Processing,* v. 30, April '44, pp. 232-235, 243-245.

Influence of moisture content of gas mixture, temperature, specimen thickness. Wet heat treatment of other grades of steel; effect of heating in air following wet heat treatment; mechanical properties of heat treated sheets after cold rolling.

18-95. **Exact Control of Heat Treatment Essential in Manufacture of Tube Cleaners.** R. R. Stevenson. *Steel Processing,* v. 30, April '44, pp. 239-240.

Alloy carburizing steel used; heat treatment; furnaces; inspection.

18-96. **Controlled Atmospheres for Heat Treating. III.** C. E. Peck. *Steel Processing,* v. 30, April '44, pp. 241-243.

Lean monogas; rich monogas; ammogas; rich combusted ammogas; lean combusted ammogas.

18-97. **Nitriding of Hardened High Speed Steel Tools.** J. G. Morrison. *Steel Processing,* v. 30, April '44, pp. 247-250. 6 ref.

Liquid nitriding of high speed steels; a comparison of the several methods used.

18-98. **Developments in the Water Quenching of Steel Castings.** Charles W. Briggs. *Foundry,* v. 72, May '44, pp. 58-59, 132.

Quenching treatment of commercial castings will be the major steel casting development of the war.

18-99. **Stress Relieving with a Welding Machine.** Ray B. Foster. *Steel,* v. 114, May 8, '44, pp. 108, 110.

Detailed recommended practice and typical results obtainable by use of a standard 240-cycle alternating-current welding machine as power source for electric induction heating.

18-100. **Tool Life Increased by Improved Annealing Procedure.** James Sorenson. *Steel,* v. 114, May 8, '44, p. 114.

Comparison of effective tool life on a turning operation between two different annealing procedures applied to SAE 4340 steel.

18-101. **"Soft Skin" on Highly Finished Surfaces.** P. Leinweber. *Engineers' Digest,* v. 1, April '44, pp. 273-275.

Method and conditions of test; treatment of test specimens.

18-102. **Technique for Spray Quench.** Frank Miller and Ben F. Shepherd. *Metal Progress,* v. 45, May '44, p. 902.

Keep liquid running in spray quench almost up to time of quenching, then shut off the spray, blow off the excess liquid and when the hot piece is in place restart the spray.

18-103. **Improved Processing Methods Help Avoid Heat-Treat Distortion.** G. W. Birdsall. *Steel,* v. 114, May 15, '44, pp. 86-89, 134, 136, 138, 140, 142, 144.

Importance of incremental or step-by-step heating and cooling methods where distortion and warping are

factors. New processes include austempering, martempering, and isothermal heat treatment.

18-104. **Refrigeration Retards Age Hardening of Aluminum Alloys.** F. Keller. *Heating and Ventilating,* v. 41, May '44, pp. 49-52.

Aluminum alloys, shortly after they have been heat treated, start to age or harden at room temperature. Riveting or bending becomes difficult. By storing the parts at cold temperatures, after the metal has been heat treated, the natural aging is retarded. The alloys remain workable over a longer period. Refrigeration has eliminated costly repetitions of heat treatment, and has speeded production in airplane plants.

18-105. **Principles of Heat Treating of Steels.** T. F. O'Brien. *Steel Processing,* v. 30, May '44, pp. 297-298, 326.

Solution, precipitation, recrystallization and grain growth, cooling and cooling rates, precautions, note on terminology.

18-106. **Eliminating Cracking in Heavy Forging Dies.** W. Haufe. *Iron Age,* v. 153, May 18, '44, pp. 66-71.

German suggestions for the proper handling of heavy drop forging dies during the hardening and tempering cycles.

18-107. **Interpretation of Isothermal Transformation Diagrams for Steel: II.** *Industrial Heating,* v. 11, May '44, pp.693-696, 698, 700, 702, 714.

Relationship of the curves to microstructure to be expected from a given treatment, and the complete explanation of a typical diagram. 34 ref.

18-108. **Tools, Dies and General Work Handled by Metal Treating Inc. Plant in Milwaukee.** *Industrial Heating,* v. 11, May '44, pp. 811-812, 814, 816, 818.

Equipped to handle tool and die hardening, carburizing, cyaniding, annealing, normalizing and general heat treating.

18-109. **Heat-Treating Accessories Improve Labor Relations.** *American Machinist,* v. 88, May 25, '44, pp. 109-110.

The Bren barrel is heat treated and roller-die quenched on a continuous basis. When stacked on skids, the "smoke" given off by the barrels was noxious to operators. This situation was overcome by design and installation of a "smoke ejector."

18-110. **An Analysis of a Typical Carburizing Gradient.** F. E. Harris. *Metal Progress,* v. 45, June '44, pp. 1111-1117.

Analyzes experiment on commercial carburizing steels and derives accurate values of the diffusion "constant".

18-111. **The Self-Annealing of Copper.** Maurice Cook and T. Ll. Richards. *Institute of Metals Journal,* v. 11, April '44, pp. 159-173.

Observations on the changes which occur spontaneously at room temperature in the X-ray and microstructure and in the physical properties of H. C. Cu strip with initial grain sizes of 0.015 to 0.02, 0.025, and 0.06 mm., and cold rolled with reductions in thickness of

80, 90, 95 and 97.5%. Spontaneous recrystallization at room temperature was observed only in those strips in which the average grain diameter of the crystals had been reduced to about 0.0008 mm. or less. In the recrystallization at room temperature, the structural change consists of a merging of the twin-fibre texture present in the cold-rolled strip to form the single-texture structure. The structure and properties of self-annealed strip are similar to those of strip which, when annealed normally, has a single-texture structure. 3 ref.

18-112. **Problems in Water Quenching. Miscellaneous Sized Steel Castings.** W. B. Libert. *Foundry,* v. 72, June '44, pp. 130-131, 256, 258.

The practice followed at Continental Foundry & Machine Co. in treating castings of miscellaneous sizes.

18-113. **Annealing Aircraft Parts in Pan-American Shops.** F. K. Whiteside. *Iron Age,* v. 153, May 25, '44, pp. 60-61, 132.

Radiant heat used to anneal and harden aluminum alloy parts. Furnace design and operating methods discussed.

18-114. **A Symposium on Water-Quenched Steel Castings.** W. B. Libert. *Steel,* v. 114, May 29, '44, pp. 86-88.

Problems of water quenching of miscellaneous steel castings can be listed as follows: Care in loading to get uniformity of loads; positioning of the castings so as to eliminate steam or water pocketing; spacing of the castings to get maximum effect upon the quenching media; adequate blocking to prevent warpage; blocking off of sections critical from the standpoint of quench cracking; uniformity of heating and holding temperatures; speed of getting quench load from furnace into the quenching media; and proper quenching practice to get maximum properties from the steel used.

18-115. **Quenching Large Steel Castings.** R. A. Gezelius. *Steel,* v. 114, May 29, '44, pp. 88, 90, 92, 94, 96.

Liquid quenching of large steel castings has not been common practice until the past few years, probably due to two factors: (1) The popular opinion among consumers that liquid quenching of castings is a dangerous practice which will not produce satisfactory results, and (2) the common viewpoint that parts with varying thicknesses must be oil quenched. Factors which must be controlled and repeated time after time in as nearly the same manner as possible are: The temperature of the casting as quenched; the severity of the quench (*a*) water temperature, (*b*) water circulation; time of immersion in water; the temperature and time of tempering after quenching.

18-116. **The Annealing of Steel.** *Metal Treatment,* v. 11, Spring '44, pp. 29-36.

The modern conception of the annealing of steel is based on the knowledge of the rate of transformation of austenite. The application of time-temperature-transformation curves to the annealing of steel, giving explicit details on the construction of these curves and many actual examples for a wide variety of steels. The

principles explained are the subjects of two U. S. A. patents but are made available by the holders to anyone wishing to use them.

18-117. **The Use of Oil in the Heat Treatment of Steels.** H. E. Priston. *Metal Treatment,* v. 11, Spring '44, pp. 62-64.

Surface effects produced when steel at a high temperature is quenched in liquid media. Outlines the essential properties of efficient oils, giving data relating to their depreciation and conditioning.

18-118. **A Note on an Arrangement for Bright Annealing of Nickel and Other Metals.** M. Balicki. *Journal of Scientific Instruments,* v. 21, April '44, pp. 67-68.

The batch of samples, with the hot-junction of the thermocouple in the middle, was placed inside a closed-end, vacuum-tight silica tube surrounded with an iron sheet, pre-annealed in vacuum at 800°, and placed inside another long silica tube. The gap between the tubes was just sufficient to allow the passage of the wires of the thermocouple which were flattened by hammering, fully annealed and carefully insulated with mica. After loosely closing the external tube, it was placed in a long electric furnace in such a manner that the samples were in a zone of uniform temperature. By suitable construction the furnace had a linear heating characteristic and was automatically regulated. The temperature of the samples could be accurately determined or recorded.

18-119. **Expansion of 24S Alclad Aluminum Sheet During Heat Treatment.** William T. Kluge. *Automotive Industries,* v. 90, June 1, '44, p. 25.

Data on the expansion of Alclad 24S-O and 24S-T aluminum sheet resulting from one and two heat treatments, as determined by North American Aviation, Inc.

18-120. **Heating Aluminum Billets by Low Frequency Induction.** E. H. Plesset and J. R. Chadwick. *Iron Age,* v. 153, June 1, '44, pp. 52-54.

Low frequency induction heating may be applied advantageously to metals of low resistivity since the depth of heat generation is large and temperature gradients in complex shapes are avoided. Experimental procedures and results reported.

18-121. **Continuous Heat-Treating Lines.** A. C. Kramer. *Steel,* v. 114, June 5, '44, pp. 100-101, 154, 156.

Typical production heat treating line, including continuous hardening furnace, automatic quench and continuous tempering furnace, all connected by conveyors. Elevator-type automatic quench for continuous heat treating lines. Spray quench setup, suitable for handling armor plate, exit end. Pressure quench setup as installed in line for heat treating armor plate. Continuous tempering furnace for treating armor plate.

18-122. **Design and Mass Important in Quenching Steel Castings.** W. J. Phillips. *Steel,* v. 114, June 5, '44, pp. 110-171.

Requisite factors for a successful quench are: Steel of sufficient hardenability for the section size involved; quenching bath of such capacity and rate of flow that

the surface of the piece being quenched approaches the temperature of the quenching medium; removal of the quenched part before its temperature has dropped below about 250° F. A successful quench will result only when the rate of temperature drop of the section exceeds the critical cooling rate of the analysis employed.

18-123. **Interrupted Quenching.** D. C. Miner. *Machine Tool Blue Book,* v. 40, June '44, pp. 129-130, 132, 134, 136, 138.

Development of method of "interrupted" quenching, in a bath of molten salt. How salt bath quenching minimizes distortion and cracking of steel parts.

18-124. **Hardening With Precision.** A. E. Shorter. *Engineers' Digest,* v. 1, May '44, pp. 347-349.

Shorter process precision method of surface or flame hardening and its advantages.

18-125. **Application of Controlled Atmospheres to the Processing of Metals.** C. E. Peck. American Society of Mechanical Engineers, Paper No. 44-SA 24, June '44.

Principal types of atmospheres; equipment for producing atmospheres; auxiliary drying and furnace equipment; atmospheres for annealing, hardening, carburizing, brazing, sintering, of ferrous and non-ferrous metals.

18-126. **The Tempering of Plain Carbon Steels.** S. G. Fletcher. Thesis for D.Sc. Degree, Massachusetts Institute of Technology, 1943.

18-127. **Tempering of Nickel and Nickel-Molybdenum Steels.** D. P. Antia. Thesis for D.Sc. Degree, Massachusetts Institute of Technology, 1943.

18-128. **Cyanide Nitriding of High Speed Steel Tooling.** Albert W. Ehlers. *Tool & Die Journal,* v. 10, June '44, pp. 87-90.

Surface treatment of high speed steel by the use of controlled temperature salt solutions.

18-129. **Working with Quenching Fluids.** *American Machinist,* v. 88, June 22, '44, pp. 113-124.

Types of quenching fluids, quenching practice and equipment.

18-130. **End-Quench Test Permits Rapid Evaluation of Steels.** Charles M. Parker. *American Machinist,* v. 88, June 22, '44, pp. 91-94.

Possible interchangeability of various types of steel can be determined easily through use of end-quench hardenability test.

18-131. **Working with Quenching Fluids.** *American Machinist,* v. 88, June 22, '44, pp. 113-124.

Tempering, heat removal during quenching, water, sodium hydroxide solution, acid and acid solutions, brines, oils, specifications for quenching oils, air, heated salt and metal baths, other quenching mediums, quantity of quenching fluids required, temperature of the bath, surface condition of quenched part, agitation of the quenching bath, immersion methods, size of quenched parts, interrupted quenches, preventing dis-

tortion, quenching surface-hardened steels, cooling the quenching fluid.

18-132. **Continuous Heat Treatment of Aluminum.** J. O. Laws. *Iron Age,* v. 153, June 22, '44, pp. 58-60, 126.

Construction and operating data for what is probably the largest and most fully automatic unit used in aluminum heat treating in the aircraft industry.

18-133. **Rifle Parts Heat Treated in Special Furnaces.** *Iron Age,* v. 153, June 15, '44, pp. 74-78.

Two unconventional units installed at the Springfield Armory, one for automatically heat treating barrel forgings, the other an unusual bottom quenching furnace for hardening operating rod handles of the M-1 Garand semi-automatic rifle without distortion or scale.

18-134. **Heat Treatment of Aluminum.** J. O. Laws. *Iron Age,* v. 153, June 22, '44, pp. 58-60, 126.

Construction and operating data for a fully automatic unit used in aluminum heat treating in the aircraft industry.

18-135. **Heat Treating High-Speed Steels in Salt Bath Furnaces.** Haig Solakian. *Steel,* v. 114, June 26, '44, pp. 88-89, 111, 114, 116.

Care and attention to details and instructions for proper operation of the salt bath pay dividends in high quality products and low maintenance of equipment.

18-136. **Processing Armorplate.** *Steel,* v. 114, June 26, '44, pp. 122, 125-126, 135.

Speeded by newly developed continuous lines. Production sequence from raw material to fully machined, heat treated parts.

18-137. **Water-Quenching Small Steel Castings.** J. W. Juppenlatz. *Foundry,* v. 72, July '44, pp. 84-87, 174.

Thermocouples show three temperatures, controlled time quenching important.

18-138. **Measurement of Case Depth by Hardness Gradient.** Thomas C. Fazio. *Metal Progress,* v. 46, July, '44, pp. 89-90.

Case depths of carburized steels are usually obtained by carbon analyses of successive individual lathe or miller cuts which vary from 0.005 to 0.015 in. deep. Accurate means of measuring carbon penetration.

18-139. **Nitriding Steels for Large Tools for Plastic Molding.** W. Haufe. *Kunststoffe,* v. 33, no. 6, June '43, pp. 151-158; *Engineers' Digest,* v. 1, June '44, pp. 406-408.

Influence of shape on the hardening stresses; nitriding; nitriding steels for molding tools.

18-140. **Continuous Heat Treatment of Steel Bars.** Irwin H. Such. *Steel,* v. 115, July 3, '44, pp. 84-85, 130, 132.

Each heat treating unit is a pair of induction heating coils for hardening and tempering, powered by standard Tocco 125 and 75-kilowatt, 9600-cycle motor-generator units, through which the bars are fed by three sets of drive rolls at speeds regulated by a speed control unit.

18-141. **Principles of Heat Treating of Steels.** T. F. O'Brien. *Steel Processing,* v. 30, June '44, pp. 361-363, 383.

Heat treating operations under two main headings: Hardening and annealing; also mechanical property charts, the process of heating steel and furnace atmosphere.

18-142. **Interrupted Quench in Salt.** *Steel Processing,* v. 30, June '44, pp. 379-382.

Austempering, isothermal quenching, martempering.

18-143. **The Control of Composition and Heat-Treatment in 0.25 C, 1.5 Mn Steel Castings.** T. W. Ruffle. Institute of British Foundrymen Advance Copy 800, June 10, '44, 5 pp.

Normalizing heats outside composition limits, water quenching and tempering, quenching, tempering temperature, time of tempering, temper brittlenss, tropenas converter steel.

18-144. **Modification by Heat Treatment of Cast Structures and Properties.** H. T. Angus. Institute of British Foundrymen Advance Copy 802, June 10, '44, 10 pp.

Effect of solidification structures upon the heat treatment and properties of two cast commercial steels, a medium carbon, and a high carbon, high silicon steel. For medium C steel figures are given for mechanical properties obtainable with various heat treatments. For high C high Si steel, the properties and structures obtainable with normalizing and spheroidizing are given, and the production and distribution of temper carbon is discussed.

18-145. **Hand Hammers.** R. T. Rolfe and J. R. Bryant. *Iron & Steel,* v. 17, May '44, pp. 379-382.

Importance of correct heat treatment and some causes of failure. 5 ref.

18-146. **End-Quench Test Reveals Changes in Steel Induced by Heat.** Charles M. Parker. *American Machinist,* v. 88, July 6, '44, pp. 100-103.

Simple testing method bears out data obtained by more laborious tests. Quenching conditions and heating controlled closely.

18-147. **Induction Hardening of A. P. Shot.** Thomas E. Lloyd. *Iron Age,* v. 154, July 6, '44, pp. 58-60.

At Eaton Mfg. Co.'s heater plant a line for heat treating and finishing 37 and 40-mm. armor piercing shot has been in operation for many months. The Tocco induction heating process provides a fast, easily manipulated and controlled method for heat treating.

18-148. **Megacycle Induction Heat for Thin Cases.** V. W. Sherman. *Metals & Alloys,* v. 19, June '44, pp. 1409-1414.

Use of frequencies higher than 1,000,000 cycles (1 megacycle) per sec. for metal treatment. Such ultra-high frequencies may have value for the production of very thin "cases" using the mass of cold underlying metal as the quenching medium rather than externally applied water. Properties of such cases, the operating factors and typical applications of megacycle heating.

18-149. **84-Inch Torsion Bars.** A. H. Allen. *Steel,* v. 115, July 17, '44, p. 130, 186.

Heat treated after machining and grinding without resulting scale or decarburization.

18-150. **Continuous Induction Heat Treating.** *Iron Age,* v. 154, July 20, '44, p. 69.

Application of Megatherm high frequency energy to finished bearing pins, each 2½ in. long by ½ in. diameter, which are case hardened to a depth of 0.025 in. as they are fed automatically through a glass tube and water quenched as they leave the heating coil at rate of 75 bearing pins per min.

18-151. **Induction Hardening Advantageous in Fabrication of Gun Parts.** *American Machinist,* v. 88, July 20, '44, pp. 96-97.

Induction hardening eliminates flame and lead-pot hardening, is faster, and avoids the problem of removing lead from recesses. Soldering and brazing by the process have speeded assembly operations.

18-152. **Expediting Curtiss-Wright Heat-Treating, Anodizing and Plating.** E. K. Fry. *Machinery,* v. 50, July '44, pp. 192-198.

Mechanical aids which save time for skilled workers have helped Curtiss-Wright to meet its increased production schedules in the face of labor shortages.

18-153. **Scaling Properties.** A. Preece and R. V. Riley. *Iron & Steel,* v. 17, May 18, '44, pp. 459-462.

Behavior of steels in furnace atmospheres at 1150° C.

18-154. **Why Carburize?** D. McPherson. *Machinery* (London), v. 64, June 1, '44, pp. 605-607.

Purpose of case hardening; function of a case hardened surface; effect of non-homogeneity on micro-hardness and crystal properties. 5 ref.

18-155. **The Rate of Heating Steel.** W. Trinks. *Industrial Heating,* v. 11, July '44, pp. 1049-1056.

Mathematical development.

18-156. **Axelson Modernizes Heat Department.** *Western Metals,* v. 2, July '44, pp. 12-15.

New equipment enlarges scope of company's work.

18-157. **Application of S-Curve Data to Heat Treating Problems.** R. L. Cunningham and Arthur Dube. *Canadian Metals & Metallurgical Industries,* v. 7, July '44, pp. 22-26.

To develop a combination of high hardness and toughness in the steel, austempering can be applied. Martempering will definitely minimize the internal stresses developed on quenching, and an isothermal annealing treatment will result in a considerable saving of time and money. To make successful use of these treatments, the S-curve of a steel should be known. Factors which affect the position of the S-curve and change the hardenability are: Variations in grain size, composition, and in carbide solution. 23 ref.

18-158. **Surface Hardening of Metals.** H. C. Gillespie. *Electronics,* v. 17, July '44, pp. 102-105, 188, 192, 196.

Plain and alloy steels processed by induction at radio frequencies above 10 kc. exhibit superior wear and fatigue characteristics. Elimination of external quenching speeds heat treatment, permits close control of cooling rate and assures uniformity of product. Distortion, scale formation and decarburization are minimized.

18-159. High-Carbon Steels. James R. Blanchard, Robert M. Parke and Alvin J. Herzig. *Iron and Steel,* v. 17, June '44, pp. 519-522.

Effect of molybdenum on the isothermal sub-critical transformation of austenite.

18-160. The Nitriding Process. E. Simister. *Metallurgia,* v. 30, May '44, pp. 18-24.

The process briefly described, modern types of nitriding steels and their heat treatment discussed, and some of the main features of nitriding equipment are described.

18-161. Some Recent Heat-Treatment Plant Installations. *Metallurgia,* v. 30, May '44, pp. 24-32.

Urgent demand for heat treatment equipment has presented many problems. To meet the emergency, production engineers, metallurgists and heat treatment plant designers have cooperated, and although the marked increase in size of equipment necessary has been largely accomplished by improvisation and adaptation, much development is evident.

18-162. Some Developments in the Hardening of Ferrous Alloys. A. E. Shorter. *Metallurgia,* v. 30, May '44, pp. 33-37.

Flame hardening has advanced from an obscure metallurgical idea to an established practice. The technique developed has improved the facilities for producing the degree of hardness desired, within the possible range, on an automatic basis. Experimental work is discussed, showing some of these developments and how they are applied in practice.

18-163. Principles of Heat Treating of Steels. T. F. O'Brien. *Steel Processing,* v. 30, July '44, pp. 436-439.

Liquid heating media, pyrometry and quenching and quenching media.

18-164. Heat Treating Hollow Steel Propeller Blades. *Steel Processing,* v. 30, July '44, pp. 445-447.

Furnaces for heat treating propellers and propeller hubs. The pit type furnace for drawing and normalizing propeller blades. A special atmosphere circular pit type furnace with rotating covers for hardening.

18-165. Springs of Case-Hardened Mild Steel. A. M. Borzdika. *Stal,* No. 1-2, pp. 42-44. *Iron Age,* v. 154, July 27, '44, pp. 49-51.

Experiments on substituting carburized mild steel for spring steel wire and strip. The method consists of deep penetration carburization at low temperatures. The use of fish scales proved to be a soft carburizing agent of great power of penetration.

18-166. Induction Heating of Propeller Blade Hubs. *Iron Age,* v. 154, July 27, '44, p. 53.

Induction heating arrangement to heat the hubs of propeller blades forged by Chevrolet has increased production measurably through improvement in handling conditions, decreased heat in the working area and more uniform temperature in the metal being worked.

18-167. **Nitriding Hardened High Speed Steel Tools.** J. G. Morrison. *Mechanical Engineering,* v. 66, August '44, pp. 539-542.

Liquid nitriding of hardened high speed steel tools appears to have its greatest field of usefulness when applied to those tools which take relatively light cuts, and where impact and other mechanical disadvantages are moderate. 6 ref.

18-168. **The Nitriding Process; Factors Influencing Ammonia Consumption.** C. V. Snell. *Metal Progress,* v. 46, August '44, pp. 299-304.

Normal operation at 970° F. consumes 20 to 30 cu. ft. of ammonia gas per hr. for every 100 sq. ft. of surface being nitrided. Operating temperature, analysis of steel, and surface smoothness, all influence consumption. A two-stage process to reduce the gas consumption and eliminate the "white layer." A new method for measuring case depth described.

18-169. **Incomplete Quenches.** *Metal Progress,* v. 46, August, '44, pp. 308-312, 314.

Timed quenching, by Muir L. Frey. Martempering, by Benjamin F. Shepherd. Hot quenching and austempering, by H. J. Elmendorf.

18-170. **Liquid Carburizing of Transmission Gears.** W. A. Silliman. *Metals & Alloys,* v. 20, July '44, pp. 58-61.

Parts treated in electric salt bath furnaces not only solved the distortion problem but also resulted in increased production and other benefits.

18-171. **Importance of Design and Mass in Water Quenching Steel Castings.** W. J. Phillips. *The Foundry,* v. 72, August '44, pp. 89, 201, 202, 204.

Influence of the size and shape of steel castings on practice followed in water quenching.

18-172. **What Quenching Oil to Use.** W. G. Forbes. *Iron Age,* v. 154, August 3, '44, pp. 50-51, 136.

Mineral oils preferred for all types of quenching.

18-173. **What New Heat Treatments of Steel Presage in Design.** Harry W. McQuaid. *Machine Design,* v. 16, August '44, pp. 107-112.

Effects of induction heating on design; combating decarburized surfaces; design benefits of improved quenching; new trends in heat treating.

18-174. **Straight-Line Processing of Armor Plate.** *Iron Age,* v. 154, August 10, '44, p. 62.

Hardening, quenching, degreasing and tempering armor plate by means of the Drever process, with Brown electronic air-controlled instruments with air operated valves reduced production costs as much as 50% in the manufacture of ⅛-in. and ¼-in. plate.

18-175. **Wartime Developments in Heat Treatment of Steel and Their Effect on Design.** Harry W. McQuaid. *Steel,* v. 115, August 21, '44, pp. 123, 164-165.

Induction hardening; isothermal heat treatments; controlled atmosphere heating; improved quenching.

18-176. **Vincent Steel Process Co., Plants Offer Broad Commercial Heat Treating Facilities.** *Industrial Heat-*

ing, v. 11, August '44, pp. 1334-1336, 1338, 1340, 1342.
Brief description of plants' equipment.

18-177. **Practical Aspects of Induction Heating.** Wesley M. Roberds. *Iron Age*, v. 154, August 24, '44, pp. 50-55.
The relation of frequency and power to depths of hardened layers and self-quenching. Design principles of applicator coils are discussed in connection with control over current densities.

18-178. **Martempering of NE and Older Alloy Steels.** *Industrial Heating*, v. 11, August '44, pp. 1254, 1256.
Equipment, procedures and results.

18-179. **A Microstructural Guide to the Heat Treatment of a Plain Carbon Steel.** R. J. Raudebaugh and W. E. Fontaine. *Metals & Alloys*, v. 20, August '44, pp. 359-364.
A means of metallographically controlling heat treatment, and also for selecting the best heat treating practice to produce a specific, desired microstructure.

18-180. **Heat Treatment Develops Best Cutting Properties.** M. Martellotti. *American Machinist*, v. 88, August 31, '44, pp. 97-100.
Understanding of the various methods of heat treatment and what goes on inside the metal during the process to secure optimum performance.

18-181. **Heat Treatment of Light Metals.** O. P. Einerl and F. Neurath. *Chemical Age*, v. 51, July 1, '44, pp. 11-16.
Improvement of mechanical properties. Maximum hardening; behavior of super-saturated solutions. 36 ref.

18-182. **How to Avoid Heat-Treat Distortion by Die Quenching.** G. W. Birdsall. *Steel*, v. 115, August 28, '44, pp. 84-86, 88, 90, 92, 94.
Distortion now held within extremely close limits by special equipment designed to correct warpage from heating and to prevent "out-of-shape" from cooling by holding distribution of temperature gradients throughout work under strict control. Advantages so gained include need for less stock and less work in finish machining, increased output, lowered production costs and better control of heat treating cycles with resultant higher quality of parts.

18-183. **Control of Heat Treatment.** A. H. Koch. *Steel Processing*, v. 30, August '44, pp. 507-510.
Time and temperature control, types of furnaces.

18-184. **A Formulation of the Carburizing Process.** Floyd E. Harris and Wilson T. Groves. *Metal Progress*, v. 46, Sept. '44, pp. 488-496.
A generalized formulation of the carburizing and decarburizing processes is made mathematically, and the predicted results then check satisfactorily against a series of experimental determinations.

18-185. **Rates of Tempering in Cobalt Steels.** Edward A. Loria. American Society for Metals 1944 Preprint No. 4, 8 pp.
Effect of cobalt on the tempering characteristics of carbon-cobalt steels studied by means of hardness

measurements. Changes during the tempering of such steels are shown to be similar in nature to those of a plain carbon steel. The cobalt promotes a small increase in hardness following tempering due to its solid solution hardening of ferrite. 6 ref.

18-186. **Isothermal Transformation and End-Quench Hardenability of Some NE Steels.** R. L. Rickett, J. G. Cutton, C. B. Bernhart, and J. R. Millikin. American Society for Metals 1944 Preprint No. 5, 22 pp.

Isothermal transformation diagram determined for each of the following NE steels: 8620, 8744 (8642), 8949, 9420, 9442, 9540, 9642 and 9650; and for comparison the end-quench hardenability of these or similar steels was measured. Microstructure of these NE steels when isothermally transformed resembles that of some S.A.E. alloy steels. The isothermal transformation diagram furnishes much more information than the end-quench curve, but the latter is a more precise measure of hardenability.

18-187. **Air Hardenability of Steels.** C. B. Post, M. C. Fetzer and W. H. Fenstermacher. American Society for Metals 1944 Preprint No. 17, 24 pp.

Center cooling velocity of regular shapes during air hardening is shown to be controlled by the area per unit volume (A/V) relationship and is independent of treating temperature. Gradient air hardenability test is described. Hardenability of several air hardening steels presented.

18-188. **Experiments on Sodium Cyaniding of High Speed Steel Prior to Hardening.** John McIntyre. American Society for Metals 1944 Preprint No. 29, 12 pp.

Experimental work on the cyaniding of three types of high speed steel prior to hardening. Hardness values of Rockwell C-68 to 70 have been obtained throughout sections of 1 in. diameter. Photomicrographs illustrating the structures obtained in the experimental pieces are included and show a marked difference from structures obtained by hard casing procedures.

18-189. **Practical Aspects of the Selection of Frequency and Time Cycles for the Processing of Metallic Parts with Induction Heating.** W. E. Benninghoff and H. B. Osborn. American Society for Metals 1944 Preprint No. 30, 27 pp.

More general usage of induction heating requires a knowledge of the various inherent characteristics and behavior of high frequency energy. Frequency, time cycles and inductor design and their relationship to the shape and dimensions of the part being treated are important. Practical approach to the application of such knowledge. 5 ref.

18-190. **Induction Hardening of Plain Carbon Steels: A Study of the Effect of Temperature, Composition, and Prior Structure on the Hardness and Structure After Hardening.** D. L. Martin and Florence E. Wiley. American Society for Metals 1944 Preprint No. 31, 46 pp.

Effect of temperature, composition and prior structure upon the induction hardening characteristics of plain carbon steel; maximum heating temperature is the important variable in induction hardening. To

obtain satisfactory properties, it is necessary to heat the steel to a high temperature where diffusion of carbon is rapid. 39 ref.

18-191. **Annealing Studies on Cold Rolled Iron and Iron Binary Alloys.** Charles R. Austin, Louis A. Luini, R. W. Lindsay. American Society for Metals Preprint No. 40, 35 pp.

Response of iron binary alloys to strain hardening by cold rolling and the behavior of the cold-rolled alloys during annealing. Data are for the alloys of iron with nickel, chromium, cobalt, silicon, manganese and molybdenum. These alloys were reduced in thickness by 5, 20, 40, 75 and 90% and the cold-rolled alloys were annealed subsequently at temperatures ranging from 625 to 1400°. Comparison studies were made on unalloyed iron in all instances.

18-192. **Low Frequency Induction Heating.** O. Kreisel. *Welding Journal,* v. 23, August '44, pp. 710-712.

Practical application for preheating and normalizing in connection with welding and other heating development.

18-193. **Cast Structures.** H. T. Angus. *Iron and Steel,* v. 17, July '44, pp. 537-540.

Modification of steels by heat treatment.

18-194. **Bright Hardening.** C. E. Peck. *Iron and Steel,* v. 17, July '44, pp. 555-558.

Developments and applications of controlled atmospheres.

18-195. **The Effect of Quenching and Prolonged Tempering on the Structures of α-Base Tin-Antimony-Cadmium Alloys. With An Addendum on the Experimental Control of Temper-Hardening in These Alloys.** W. T. Pell-Walpole. Institute of Metals *Journal,* v. 70, July '44, pp. 339-348.

The microstructures of 80 alloys have been examined after the following treatments: (1) Annealed to equilibrium at 150° C.; (2) quenched from the maximum practicable annealing temperature; (3) as (2), then tempered at 150° C. for 8, 16, 32, 70, 150, 500, and 1000 hrs. Typical microstructures showing changes in structure produced by tempering are given. Changes in structure are correlated with changes in mechanical properties. Temper-hardening accompanies fine acicular precipitation of the δ phase, while stability during prolonged tempering depends upon the degree to which this precipitation coalesces. Intergranular embrittlement caused by tempering certain alloys is shown to be caused by precipitation of films of ϵ phase on the grain boundaries. 4 ref.

18-196. **The Control of Composition and Heat-Treatment in 0.25 C 1.5 Mn Steel Castings.** T. W. Ruffle. *Foundry Trade Journal,* v. 73, July 13, '44, pp. 215-220.

Data of use and interest to steel founders who have had no previous experience with this type of steel. Composition; heat treatment—normalizing; heats outside composition limits; water quenching and tempering; quenching; tempering temperature; time of tempering; temper brittleness; Tropenas converter steel.

18-197. **High-Frequency Heating.** A. G. Robiette. *Metal Treatment,* v. 11, Summer '44, pp. 83-90.

Fundamental principles, the metallurgical effects and the economics of high frequency heating. Indicates some of its immense possibilities.

18-198. **Heat Treating Broaches.** William L. Gibbons. *Steel,* v. 115, Sept. 11, '44, pp. 106, 108, 110, 166.

Routine for hardening broaches is undergoing many progressive changes in step with widened use of the broach for high speed cutting of extremely hard metals. Range of equipment insures flexibility to meet changes.

18-199. **Nitriding the Austenitic Steels Improves Wear Resistance.** I. A. Binder. *American Machinist,* v. 88, Sept. 14, '44 pp. 102-104.

A case depth of only 0.004 to 0.005 in. is secured when nitriding the heat resisting steels, but this treatment gives these materials a longer life if subject to friction.

18-200. **Nitriding Hardened High-Speed Steel Tools.** J. G. Morrison. *Canadian Metals and Metallurgical Industries,* v. 7, Sept. '44, pp. 28-30, 46-47.

Performance of high speed steel cutting tools greatly improved by various surface-altering procedures. Methods employed are chromium plating, liquid nitrating, surface oxidation, and surface oxidation imposed on a nitriding surface. This paper deals primarily with nitriding, and gives a comparison of the several methods.

18-201. **Hydraulic System Components.** G. Eldridge Stedman. *Steel,* v. 115, Sept. 18, '44, pp. 108-109, 144, 146, 148, 151-152.

West Coast plant employs improved methods in heat treating.

18-202. **The Principles and Practice of Lithium Heat Treating Atmospheres. I.** Charles E. Thomas. *Industrial Heating,* v. 11, Sept. '44, pp. 1405-1406, 1408, 1410, 1412, 1414, 1416.

Summarizes the various steps connected with the development of the use of lithium metallic vapor in atmospheres in the heating chambers of industrial furnaces for the prevention of scaling and decarburization, in the carburizing medium employed in gas carburizing, for descaling, and for restoration of carbon to decarburized steel.

18-203. **The Heatreat Company Specializes in Mass Production Heat Treatment of Large Runs.** *Industrial Heating,* v. 11, Sept. '44, pp. 1518, 1520, 1522.

Box-type general-purpose furnaces; tool-room type furnaces; electric salt bath furnace; pot-type salt bath furnaces; tempering equipment; instrumentation; quenching facilities; testing and inspection.

18-204. **Leaf Spring Production.** John Ade. *Steel,* v. 115, Sept. 25, '44, pp. 80-81, 136, 138.

Close control over heat treatment forces designer to stay close to physical limits of material used. Procedure used by Standard Steel Spring Co. described.

18-205. **Continuous Hardening.** *Scientific American,* v. 171, Oct. '44, pp. 169-170, 172.

High frequency process is being commercially applied to treatment of steel bars of various diameters, shapes, and lengths. Results thus far show appreciable savings in costs, plus increased machinability. Equipment is virtually automatic and requires a minimum of manpower.

18-206. **An Investigation on the Effects of Varying Precipitation Conditions in Magnesium-Aluminum Alloys of Elektron AZ91 Type.** E. Lardner. *Magnesium Review,* v. 4, April '44, pp. 51-58.

For Elektron AZ91 type alloys alternate methods of precipitation treatment other than by reheating the supersaturated solid solution possess no advantages, either in respect of improved mechanical properties or of reduced heat treatment times. 1 ref.

18-207. **Continuous Hardening of Steel Bars by Induction.** *Steel Processing,* v. 30, Sept. '44, pp. 574-575.

Tocco equipment now being used for this application by the Caterpillar Tractor Co.

18-208. **Continuous High Frequency Heat Treatment.** *Steel Processing,* v. 30, Sept. '44, pp. 578-579.

Application to finished bearing pins, each 2½ in. long by ½ in. diameter, case hardened to a depth of 0.025 in. as they were fed automatically through a glass tube and water quenched as they left the heating coil at the rate of 75 bearing pins per minute.

18-209. **Heat Treating Controls Productivity of Band Files.** H. J. Chamberland. *Steel Processing,* v. 30, Sept. '44, pp. 581-583.

Absolute control over every phase of heat treating is the secret of band file performance.

18-210. **Control of Heat Treatment.** A. H. Koch. *Steel Processing,* v. 30, Sept. '44, pp. 584-590.

Surface protection in the furnace chamber, controlled cooling and control of quench.

18-211. **Nitriding Ferroalloys. II.** Ralph H. Steinberg and Dave Steinberg. *Metals & Alloys,* v. 20, Sept. '44, p. 630.

Results of nitriding the more or less well-known ferro-alloys used in steel making, along with the nitriding of scale or ferrous oxide.

18-212. **Sub-Zero Treatment to Improve Tool Life.** Stewart M. DePoy. *Metals & Alloys,* v. 20, Sept. '44, pp. 645-649.

Extraordinary life extensions or productivity increases enjoyed by steel tools subjected to refrigeration at selected sub-zero temperatures during the hardening cycle. Use of sub-zero treatment for strain relief.

18-213. **Heat Treating Sheets.** *Steel,* v. 115, Oct. 2, '44, p. 104.

A salt bath heat treating furnace for handling aluminum sheets affords advantages in automatic operation and temperature control.

18-214. **Facilities for Water Quenching Steel Castings.** R. H. Swartz. *Foundry,* v. 72, Oct. '44, pp. 82-84, 230, 232, 234, 236.

Furnace equipment and quench facilities that are required for effective water quenching of steel castings.

18-215. **An Unusual Heat Treat and Stress Relief Application.** Gerald Eldridge Stedman. *Industrial Gas*, v. 23, Oct. '44, pp. 19-21, 48.

The design of the gas-fired heat treat and stress relief furnace.

18-216. **Continuous Hardening of Engine Parts.** Willard Roth. *Steel Processing*, v. 30, Oct. '44, pp. 663-666.

Hardening and quenching of engine parts in continuous and automatic type furnaces using protective atmospheres.

18-217. **Furnaces for Heat Treating Aircraft Parts of Aluminum Alloy.** Cecil J. Mayo. *Metal Progress*, v. 46, Oct. '44, pp. 693-698.

Elevator type furnaces, with electrically heated and recirculated atmospheres, developed many troubles from sagging doors and faulty hoisting devices. They were rebuilt with a positive-action plunger hoist which carries the load at all times and whose motion is adequately interlocked with the door-opening mechanism. Problems now have principally to do with construction of work racks and provision of furnaces with high headroom, so long pieces or sheets can be heat treated while hanging end-wise.

18-218. **"Interrupted" Quenching in Salt Baths.** Arnold P. Seasholtz. *Metal Progress*, v. 46, Oct. '44, pp. 730-738.

High temperature soak; effects of quenching media; austempering; isothermal quenching.

18-219. **Double Temper Mo-W High Speed at Slow Heating Rate.** K. J. Trigger. *Metal Progress*, v. 46, Oct. '44, pp. 743-745.

The effect of the heating rate in tempering. The effectiveness of a double temper on the transverse strength of small test beams.

18-220. **Heat Treating 5-in. Navy Shells.** *Iron Age*, v. 154, Oct. 5, '44, pp. 64-65.

Conveyor type heat treating equipment. Special furnaces and machinery for the handling of shells.

18-221. **Annealing.** *Automobile Engineer*, v. 34, Sept. '44, p. 371.

The effect of annealing temperature and period on the softening of previously cold worked metal.

18-222. **The Effect of Time and Temperature on the Relief of Residual Stresses in Low-Alloy Steels.** J. K. McDowell and Paul C. Cunnick. *Welding Journal*, v. 23, Oct. '44, pp. 481-s-486-s.

The degree of stress relief obtained is affected more by temperature than time at temperature. With few exceptions, a heat treatment of 1 hr. at a given temperature provides an equal or greater amount of stress relief than 8 hr. at a temperature 100° F. lower.

18-223. **Extending Cutting Tool Life by Refrigeration and Nitriding.** C. S. Lucas and H. M. Hartley. *Iron Age*, v. 154, Oct. 12, '44, pp. 74-77, 168.

Sub-zero refrigeration is being used as a means of reclaiming multipoint high speed steel tools that are

too soft in the "as received" condition. Salt bath nitriding is also being applied in the tool crib as a means of obtaining additional production yield on taps, chasers and milling cutters. Cutting edge finish and tool life are improved by regrinding and honing.

18-224. **Armor Plate Developments.** *Steel,* v. 115, Oct. 16, '44, p. 106.

Die quenching of heat treated homogeneous armor plate has been developed by Ford Motor Co. engineers to facilitate the straightening of plate after heating and prior to drawing.

18-225. **Controlling the Temperature of Quenching Oil.** Metallurgicus. *Metal Progress,* v. 46, Oct. '44, pp. 713-714.

Methods of heating and cooling oil.

18-226. **Sub-Zero Treatment of Steel, a New Departure in Shop Practice.** H. C. Amtsberg. *Machinery,* v. 51, Oct. '44, pp. 137-144.

Changes that take place in steel when subjected to very low temperatures following the usual heat treatment open up an entirely new field in the treatment of cutting tools and tool steels in general. 11 ref.

18-227. **Surface Heating by Induction.** Herbert F. Storm. *Electrical Engineering,* v. 63, Oct. '44, pp. 749-754.

Induction heating offers a method for heating of electrical conductors such as steel, brass, graphite, by exposing them to a varying magnetic field. 2 ref.

18-228. **Induction Heating—Selection of Frequency.** N. R. Stansel. *Electrical Engineering,* v. 63, Oct. '44, pp. 755-759.

Relation of frequency and kilovolt-ampere capacity as the basis for the selection of the frequency for a given heating service. 6 ref.

18-229. **Skin Recovery for Decarburized Steel Surfaces.** Orville E. Cullen. *Metals and Alloys,* v. 20, Oct. '44, pp. 954-958.

Heat treatment in a simple controlled atmosphere process based on the principle of carbon pressure balance, and how it is being applied today to the recarburizing of various engineering steels.

18-230. **Salt Bath Quenching Processes.** Harold J. Babcock. *Metals and Alloys,* v. 20, Oct. '44, pp. 964-972.

Describes the practical processes (martempering, austempering and cycle annealing) and cites applications of salt bath quenches to the improved heat treatment of various war products. 8 ref.

18-231. **Quenching Furnace Suitable for Small Specimens.** E. A. Owen. *Journal of Scientific Instruments,* v. 21, no. 4, April '44, pp. 65-66. *Engineers' Digest,* v. 1, Sept. '44, pp. 579-580.

Furnace designed especially for use with small specimens in lump or in powder form.

18-232. **Sub-Zero Treatment of Steels.** H. C. Amtsberg. *Steel,* v. 115, Oct. 23, '44, pp. 78, 80, 82.

Value of process unquestioned and it is likely to become routine part of normal heat treating practices; fundamentals involved in hardening steels at low temperatures.

18-233. **A Study of Sub-Zero Treatments Applied to Molybdenum-Tungsten High Speed Steel.** Ralph G. Kennedy, Jr. American Society for Metals 1944 Preprint no. 28, 44 pp.

Effect on physical properties of such factors as the sub-zero temperature reached, the time of holding at this temperature and the time of aging at room temperature before sub-zero cooling. The effect of sub-zero cooling before and after tempering has been examined in conjunction with the usual heat treatment variables of hardening temperature, tempering temperature, and quenching temperature attained before tempering. 26 ref.

18-234. **Nitriding High-Speed Steel Tools.** *Machinery* (London), v. 65, Sept. 28, '44, p. 345.

Metallurgical and the practical application aspects.

18-235. **The Cold-Treatment of High-Speed Cutting Tools.** F. W. Whitcomb. *Machinery* (London), v. 65, Sept. 28, '44, pp. 350-351.

Procedure.

18-236. **Small Producer Gas Plant for Heat Treatment and Other Processes.** *British Steelmaker,* v. 10, Oct. '44, pp. 462-464.

Feature of a new producer is that it requires no special foundation work, concrete flumes or seals, nor extensive calls upon auxiliary services.

18-237. **How Long is "Holding Time?"** W. Trinks. *Industrial Heating,* v. 11, Oct. '44, pp. 1626, 1628, 1632.

Reasons for holding at temperature; effect of method of heating; suggested specification changes; practical example.

18-238. **Methods and Equipment for Induction Heating.** C. C. Levy. *Iron & Steel Engineer,* v. 21, Oct. '44, pp. 51-58.

Induction heating has made rapid strides particularly as a mass production machine tool.

18-239. **Induction Heating.** G. E. Shaad. *Iron & Steel,* v. 17, Oct. '44, pp. 663-666.

Advantages and possibilities of high frequency equipment for heat treatment.

18-240. **Nitrogen Surface - Hardening.** A. G. Arend. *Chemical Age,* v. 51, Oct. 7, '44, pp. 347-349.

Developments of ammonia processes.

18-241. **Post-War Steel and Its Treatment.** Harry W. McQuaid. *Metal Progress,* v. 46, Nov. '44, pp. 1067-1073.

Post-war technological picture as it affects those interested in the selection and heat treatment of steel.

18-242. **Diagram of Transformation During Continuous Cooling of Steel (a Necessary Guide for Propeller Heat Treatment).** C. A. Liedholm. *Metal Progress,* v. 46, Nov. '44, pp. 1096-B, 1097-1101.

A simple method of plotting these diagrams (similar in nature to the S-curves or TTT-curves for isothermal transformation except they record the occurrences during total quenches of any practicable velocity). Shows how the diagram has been invaluable in controlling the

die quenching under internal pressure of hollow steel propeller blades.

18-243. **Heat Treatment of Moderately Heavy Cast Steel Sections.** K. L. Clark, H. F. Bishop and H. F. Taylor. *Foundry,* v. 72, Nov. '44, pp. 82-84.

Quenching and tempering treatments have advantageous possibilities for heavy castings of suitable design.

18-244. **Heating of Steel in Controlled Atmospheres.** Sam Tour. *Mechanical Engineering,* v. 66, Nov. '44, pp. 727-728.

Review of the development and status of the art of heating steel in controlled atmospheres traces the development for a period of approximately 30 years, beginning just prior to the first world war. The chronological arrangement is broken down into the periods of basic research, adaptation to practice, general acceptance and modern trends, and modern equipment. 15 ref.

18-245. **Sub-Zero Treatment of Steels.** H. C. Amtsberg. *Machine Tool Blue Book,* v. 40, Nov. '44, pp. 131-132, 134, 136, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158.

The fundamentals of cooling hardened steels to temperatures considerably below room temperature, properly correlated with the basic treatment cycle and related structural changes.

18-246. **Controlled Atmospheres for Processing Metals.** C. E. Peck. *Steel,* v. 115, Nov. 6, '44, pp. 114-116, 118, 144, 146, 148, 150, 153-154, 156, 158, 160, 162, 164.

The various types of controlled atmospheres, the equipment required for making them, and the applications for which they are best suited.

18-247. **What Quenching Oil Not to Use.** G. W. Pressell. *Iron Age,* v. 154, Nov. 9, '44, pp. 62-65.

Modern quenching oils, with the proper selection of base stock and subsequent fortifying with additions to secure oxidation stability and quenching speed. The results are predictable properties of treated steels, uniformly and regularly in mass production.

18-248. **Flame Hardening Blanking Dies.** Lin Mager. *Tool Engineer,* v. 14, Nov. '44, pp. 73-74.

Facilitating thin die construction, flame hardening is recommended to prevent warp, save grinding to size. New design flame tip includes water jacket to permit careful control necessary to highly important quenching operation.

18-249. **Flame-Hardening of Sprocket Teeth.** Stephen Smith. *Machinery,* v. 51, Nov. '44, pp. 139-147.

Newly developed methods which will prove of great value in post-war applications.

18-250. **Manufacture and Heat Treatment of Hairsprings.** J. W. Whittaker. *Metal Treatment,* v. 11, Autumn '44, pp. 193-198.

Manufacture and heat treatment of fine instrument hairsprings.

18-251. **Steel Treating.** Fred P. Peters. *Scientific American,* v. 171, Dec. '44, pp. 253-254.

Wartime advances in the heat treatment of munition steel not only assure higher quality steel parts at lower

cost for peacetime products, but will be responsible for widespread changes in the design and performance of lighter or more powerful engines and machines.

18-252. **Practical Aspects of the Selection of Frequency and Time Cycles for the Processing of Metallic Parts by Induction Heating.** H. B. Osborn, Jr. Electrochemical Society Preprint, 86-16, Oct. 16, '44, 1 p.

Proper frequency, time cycles, and inductor design, and their relationship to the shape and dimensions of the metal part being treated are extremely important.

18-253. **Induction Heating and Its Application to Annealing and Melting.** J. W. Cable. Electrochemical Society Preprint, 86-18, Oct. 16, '44, 6 pp.

Annealing of steel cartridge cases; the localized annealing of large steel dies for stamping sheet metal; and the continuous heating of steel tubing.

18-254. **Case Hardening by Megacycle Induction Heating.** Vernon W. Sherman. Electrochemical Society Preprint, 86-22, Oct. 16, '44, 11 pp.

Radio frequency energy makes possible thin case hardening of finished ground metal parts without scaling or distortion. Megacycle induction heating reduces oxidation and scaling to negligible values even in ordinary atmosphere, and prevents alteration of the physical characteristics of the metal underlying the hardened case.

18-255. **Modification by Heat Treatment of Cast Structures and Properties.** H. T. Angus. *Foundry Trade Journal,* v. 74, Oct. 19, '44, pp. 131-135.

Castings can be heat treated to give reliable mechanical properties. 2 ref.

18-256. **Partition of Molybdenum in Steel and Its Relation to Hardenability.** Fred E. Bowman. *Steel,* v. 115, Nov. 27, '44, pp. 82, 84, 86.

During transformation of austenite to pearlite, molybdenum in iron-carbon-molybdenum alloys of approximately eutectoid carbon content segregates in the carbide phase. Necessity for its diffusion during transformation process is indicated.

18-257. **Nitrided Steels.** E. Ineson and C. Petteford. *Iron & Steel,* v. 17, Nov. '44, pp. 699-702.

Process and choice of materials.

18-258. **The S-Curve and Its Significance in the Practical Heat Treatment of Steel.** A. L. Simmons. *Australasian Engineer Science Sheet,* June 1, '44, pp. 2-19. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 152-A.

Shortcomings of the iron-carbon diagram with regard to the practical heat treatment of steel. S-curves are introduced with details of their method of construction, and their relation to cooling curves and hardenability. It is shown how variables such as composition and grain size influence the shape of the S-curves and the modern interpretation of the martensite region described. The continuous-cooling S-curve is dealt with briefly, followed by detailed discussion of various practical treatments (such as spheroidizing, annealing, nor-

malizing, austempering, martempering and hardening) in their relationship to the various regions in the curve.

18-259. **Distortion as a Production Problem.** H. Petzal. *Machine Shop Magazine,* v. 5, June '44, pp. 80-86; July, '44, pp. 72-76. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 154-A.

The causes and cures for distortion in heat treated parts discussed. Normalizing in the initial production stages of rods or blanks is the safest means of forestalling some of the distortion difficulties which originate in non-uniform raw material.

18-260. **Modification by Heat-Treatment of Cast Structures and Properties.** H. T. Angus. *Foundry Trade Journal,* v. 74, Nov. 2, '44, pp. 171-177.

Castings can be heat treated to give reliable mechanical properties. 4 ref.

18-261. **Continuous Annealing of Cartridge Cases.** Clarence A. Maurer. *Metals and Alloys,* v. 20, Nov. '44, pp. 1302-1303.

Adaptation of a continuous convection type tempering furnace to the continuous annealing of brass cartridge cases; furnace design and operating details and the results obtained.

18-262. **Essential Characteristics of Controlled Atmospheres.** W. D. Vint. *Metallurgia,* v. 30, Oct. '44, pp. 293-296.

Demand for greater multiplicity of light steel articles is growing. Necessity for cold-working operations in shaping them, and the rigid physical specifications demanded. Bright annealing as an intermediate stage in production has become a major phase in manufacturing technique. Bright annealing can be carried out in any type of non-oxidizing atmosphere. Essential characteristics of these atmospheres.

18-263. **Sub-Zero Treatment Improves Tool Life of High-Speed Steels.** T. M. Snyder. *American Machinist,* v. 88, Nov. 23, '44, pp. 91-93.

Production checks show that sub-zero temperatures as part of the heat treatment cycle improve performance of high speed steels.

18-264. **Distortion of Aluminum Aircraft Parts During Heat Treating and Quenching.** W. P. Sykes. *Western Metals,* v. 2, Nov. '44, pp. 42, 44-45, 47.

With a slow quench, warping is reduced but precipitation of compounds occurs in larger particle size during age hardening. This reduces the yield point and provides excellent chance for intergranular corrosion. To avoid these defects the part must be heat treated and quickly quenched; major factor contributing to the warping of the aluminum part is the type of quench.

18-265. **Sub-Zero Treatment of Steel.** H. C. Amtsberg. *Steel Processing,* v. 30, Nov. '44, pp. 721-725.

Presentation of the fundamentals of cooling hardened steels to temperatures considerably below room temperature properly correlated with the basic treatment cycle and related structural changes. 11 ref.

18-266. **Application of Controlled Atmospheres to Metal Processing.** C. E. Peck. *Steel Processing,* v. 30, Nov. '44, pp. 729-735, 748.

Principal types of atmospheres, and the equipment available for producing these atmospheres. Application of the various atmospheres to a wide variety of heat treating processes now in active commercial use.

18-267. **Some Needed Precautions When Induction and Flame Hardening.** J. O. Almen. *Metal Progress,* v. 46, Dec. '44, pp. 1263-1267.

Surface hardening after carburizing produces parts with residual compressive stresses at the surface—a very desirable condition to enhance fatigue resistance against alternating loads in bending or torsion. Flame hardening produces lower surface compressions, and an underlying layer in tension dangerous to fatigue resistance. Induction hardening acts in a similar way, but the extent of this zone in tension can be limited by controlling frequency and power input.

18-268. **Quenching Oils.** Metallurgicus. *Metal Progress,* v. 46, Dec. '44, pp. 1273-1274.

Effective oil circulation for improving cooling rate.

18-269. **Hardenability of Some Cast Steels.** J. B. Caine. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 459-474.

Hardenability of some cast steels, and the correlation of these results with those of wrought steels reported. Results checked with those obtained, theoretically, from the chemical analysis. 7 ref.

18-270. **Heat Treatment of Medium Carbon Cast Steel in Moderately Heavy Sections, II.** K. L. Clark, H. F. Bishop and H. F. Taylor. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 539-542.

Unrestricted heating rates, higher than usual temperatures of heating, abbreviated holding periods, and both water-quenching and normalizing with subsequent tempering treatments were tried as means of reducing "in-the-furnace" time. Results show that physical properties produced by the shorter treatments were equal to or, in most cases, better than those which were obtained from the annealed castings.

18-271. **Wartime Developments in the Heat-Treatment of Steel and Their Effect on the Design of Automotive Equipment.** H. W. McQuaid. *SAE Journal,* v. 52, Dec. '44, pp. 598-608.

Headed for an era in which our expanded knowledge will result in an increase in the actual strength of highly stressed parts, permitting an important reduction in the so-called "factor of ignorance." Will also be necessary for the metallurgist, the designer, and the production engineer to work together much more closely during the development of any important design, including the preparation of the stress analysis.

18-272. **Precision Electric Hardening of Naval Ordnance Parts.** Charles O. Herb. *Machinery,* v. 51, Dec. '44, pp. 140-147, 169.

By induction hardening, wearing surfaces of the internal teeth in the large training circles for naval gun

mounts are uniformly hardened to a scleroscope reading of from 55 to 60 without distortion of the tooth form.

18-273. **Builds New Laboratory to Explore and Engineer Electric Induction Heating.** *Steel,* v. 115, Dec. 4, '44, pp. 116-118.

High frequency induction experimental laboratory of the Tocco Division of the Ohio Crankshaft Co. Equipment described.

18-274. **The Annealing of Cast Steel.** A. Evers and E. Piwowarsky. *Archiv für das Eisenhuttenwesen,* v. 17, July-August, '43, pp. 35-42. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, 165-A.

Study of the effects of chromium and chromium plus molybdenum, the initial structure, the annealing temperature and time and the cooling rate on the properties of cast steel. The Ac_3 point for the 0.30% carbon steel used was 850° C. The annealing temperatures selected were 820°, 850°, 880° and 910° C. with holding times of 4½ hr., 1¾ hr. and 15 min. at each of these temperatures. The evaluation of the numerous test results showed that by careful selection of the annealing time a completely transformed structure and good mechanical properties could be obtained by annealing at temperatures slightly below or slightly above the GOS line; the selection of a precise annealing temperature was not essential for obtaining a maximum impact strength, but in all cases the annealing time had to be carefully adjusted to suit the temperature selected. The optimum elongation and reduction of area values were generally obtained after annealing at, or slightly above, the GOS-line temperature. The small additions of chromium and molybdenum used (up to 0.54% of chromium and 0.30% of molybdenum) improved the impact strength and tensile strength of steel made in the small bessemer converter but did not affect the strength of the open-hearth and electric-furnace steel. The impact strength, elastic limit and tensile strength were lower after cooling in the furnace than after cooling in air.

18-275. **Elimination of Flakes by Heat-Treatment.** G. Cholmogorov. *Stal,* v. 10, no. 9, '40, pp. 31-33; *Chem. Zentr.,* I, '41, p. 3437; *Alloy Metals Review,* v. 3, Sept. '44, p. 1.

Hydrogen content and segregation, rather than structural transformations and internal stresses, are the primary causes of flake formation. In low alloy steel ingots, flake formation can be almost entirely avoided by a preliminary anneal at 950° and cooling to 100° at a rate of 10 to 12° per hour, provided the steel is also cooled slowly after hot working.

18-276. **Ford Development of Centrifugal Casting and Heat Treatment of Aircraft-Engine Cylinder Barrels.** *Industrial Heating,* v. 11, Dec. '44, pp. 1987-1988, 1990, 1992, 1994, 1996, 1998, 2000, 2002.

Procedures for centrifugal casting of cylinder barrels. Advantages of method.

18-277. Theory and Practice of Induction Heating. *Industrial Heating,* v. 11, Dec. '44, pp. 2004, 2006, 2008, 2010.

Principles involved in and the practical application of induction heating utilizing the various types of commercially available equipment.

18-278. Conveyor-Type Salt-Bath Furnace Used for Annealing Brass Cartridge Cases. *Industrial Heating,* v. 11, Dec. '44, pp. 2012, 2014, 2016.

Increased speed of production with a full, bright anneal.

18-279. Effect of Alloys on Hardenability and Air-Hardenability of Steels. *Industrial Heating,* v. 11, Dec. '44, pp. 2018, 2020, 2022, 2034.

Effect of carbon content on hardenability, the air hardenability of steels, the partition of molybdenum in steel and its relation to hardenability, and the rate of diffusion of molybdenum in austenite and in ferrite.

18-280. Research in Metal Heating. *Scientific American,* v. 172, Jan. '45, p. 38.

Cheaper and tougher metal parts for many uses are expected to follow as a result of research at a new laboratory for the development of wider applications of high frequency induction heating to the tasks of metal hardening, brazing and annealing.

18-281. Three Million Steel Cartridge Cases Successfully Heat Treated by Electric Induction Heating. Fred M. Arnold. *Steel,* v. 115, Dec. 25, '44, pp. 102, 105, 107, 122.

Advanced heat treating techniques.

18-282. Employing the Corrosion Resistance of Stainless Steel for Surface Hardening. R. C. Cunningham. *Steel,* v. 115, Dec. 25, '44, pp. 74-75, 116.

Two-step process develops controlled case hardened depth for superior resistance to wear under dry or lubricated conditions. Slight dimensional changes are predictable. Low temperatures with gradual changes minimize detrimental warpage.

18-283. Annealing and Stress Relief of 3-in. Cartridge Cases. Gerald E. Stedman. *Industrial Gas,* v. 23, Dec. '44, pp. 9-11, 28.

Lithium atmospheres.

18-284. The Effect of Overheating on the Transformation Characteristics of a Nickel-Chromium-Molybdenum Steel. K. Winterton. Iron and Steel Institute, Advance Copy, Nov. '44, 7 pp.

S-curve for a nickel - chromium - molybdenum steel has been determined by a dilatometric method, using an initial treatment of 10 min. at 850° C. By the same means the S-curve was redetermined after 10 min. treatment at 1200° C. (before treatment at 850° C.). The isothermal characteristics were also found for a prior treatment of only 1 min. at 1200° C. 8 ref.

18-285. Some Observations on the Austempering and Isothermal Transformation of Steels, with Special Reference to the Production of Martensite. F. C. Thompson and L. R. Stanton. Iron and Steel Institute, Advance Copy, Nov. '44, 38 pp.

Theoretical explanation based on the rate of recrystallization is offered to account for the shape of the typical S-curve representing the isothermal transformation of austenite; from the results of experimental work it is suggested that the retention of austenite and the subsequent "period of induction" depend on the relaxation of stresses set up in the material at the time of quenching. **42 ref.**

SECTION XIX

WORKING

Rolling; Drawing; Pressing; Forging

19-1. **Determining Defects in Forgings.** *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 60-61.

Table listing type of defect, alloy composition, melting, pouring, processing stock, heating prior to forging, forging equipment, design of forging, forging operation and heat treatment.

19-2. **Forged and Coined Gears.** *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 78-80, 116-118.

Save 50% stock; reduce cost; NE steel meets requirements; special gear cutting equipment need eliminated.

19-3. **Fabricating 18-8 Stainless.** Jerome Wilford. *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 65-70.

Budd Mfg. Co. produces more than 50 million lb. of stainless steel parts. 18-8 austenitic used; stamping and pressing operations, contour machines, stretching fixtures discussed.

19-4. **Steel Processing.** *Steel Processing,* v. 29, no. 12, Dec. '43, pp. 623-626.

The Pilger process is a unique method of producing seamless tubing. After cylindrical billets are pierced, the rolling process differs fundamentally from the usual method of completing tubes. The elliptical rolls used to form the tubing rotate in a direction opposite to the feed of the steel which is pressed against the rolls by a ram. The steel is fed forward by the ram when the pass between the rolls is wide.

19-5. **Chemical and Physical Control in Relation to Rolling and Deep-Drawing Industries.** C. Stuart Dobson. *Metal Industry,* v. 63, no. 25, Dec. 17, '43, pp. 386-388.

In the system are outlined the chief requisites as follows: (1) A routine laboratory for chemical and physical control. (2) An applied research or experimental department. (3) A pure research department. (4) A statistical department.

19-6. **Fabrication of Aircraft Parts.** F. C. Hoffman. *Iron Age,* v. 153, no. 3, Jan. 20, '44, pp. 60-67.

The problem of springback in formed parts, such as those with flanges, is related to basic stress-strain theory and the plastic behavior of metal. Tests show

that per cent elongation values for a given material vary widely, depending upon the distance between gage points in the tensile specimen.

19-7. **Tubes and Tube Making.** Bernard P. Planner. *Iron Age,* v. 152, no. 27, Dec. 30, '43, pp. 54-56.

The advantages of drawing. The Rockrite process which utilizes compressive rather than tensile stresses to accomplish reduction is described.

19-8. **Mass Production of Kirksite Blanking Dies.** W. W. Broughton. *Iron Age,* v. 153, no. 3, Jan. 20, '44, pp. 70-74.

Flat plow steel punches are used in conjunction with rolled Kirksite "A" zinc alloy dies, which are broached to final size by the punch itself. The soft dies are self-sharpening. The practice in making such dies in a number of aircraft plants is reviewed.

19-9. **Method of Forming Aluminum Alloy Extrusions and Preformed Sheet Metal Sections.** William Schroeder. *Automotive & Aviation Industries,* v. 90, no. 2, Jan. 15, '44, pp. 28-31, 100.

Manual and semi-manual, and machine forming methods. Advantages of the method discussed: (1) Simple roll profiles are maintained. (2) Bending may be accomplished about axes other than the minimum principal axis. (3) Angle changes between flanges and web or between flanges in the cross-section of the extrusion may be produced by this method.

19-10. **Boeing Die Pierces 976 Holes in 10 Parts During 5 Press Operations.** *Automotive & Aviation Industries,* v. 90, no. 2, Jan. 15, '44, pp. 40, 102, 104.

Catwalk piercing die incorporates 388 punches with a hole location accuracy of .0005". This die pierces 976 riveting holes in 10 separate parts and production time is improved 34 times over former method.

19-11. **Pressure Forming of Metals.** C. L. Davidson and W. E. Bloom. *Western Metals,* Jan. '44, pp. 7-8.

Process developed for forming aluminum hydraulic fittings is adaptable to forming other metals and more complicated shapes.

19-12. **Power Consumption in the Rolling of Steel Shapes.** M. Steffes. *Engineers' Digest,* v. 1, no. 1, Dec. '43, pp. 22-24.

The relationship between hourly mill output and shapes rolled.

19-13. **Roll More Tons—VI.** A. E. Lendl. *Iron & Steel,* v. 17, no. 4, Dec. '43, pp. 173-179.

Investigation of the first forming pass of beam calibration.

19-14. **Shell Forgings on Bulldozers.** *Machinery* (London), v. 63, no. 1622, Nov. 11, '43, pp. 539-543.

Description of three methods by which bulldozers have been adapted to the forging of high-explosive shells: (1) Progressive pierce-and-draw method. (2) Method by which the bulldozer pierces in one stroke. (3) The Frinch extrusion process.

19-15. **Improved Wire-Working Machines.** A. G. A. *Machinery* (London), v. 63, no. 1621, Nov. 4, '43, pp. 516-519.

Structural details of machines for straightening, cutting-off, and automatic forming of wire.

19-16. **Stretching Structural Parts for Aircraft.** F. C. Hoffman. *Machinery* (London), v. 63, no. 1623, Nov. 18, '43 pp. 561-570.

Stretch forming tests and production methods of Al alloy sheet.

19-17. **The Design of Stampings for Quality Production.** R. A. W. *Machinery* (London), v. 63, no. 1625, Dec. 2, '43, pp. 627-629.

Nine classes of stampings and the properties of the various metals which may be used for stampings.

19-18. **Production Short-Cuts on Aircraft Parts.** R. H. R. *Machinery* (London), v. 63, no. 1626, Dec. 9, '43, pp. 645-650.

Smoothing out wrinkles, use of Zn alloy dies for blanking and forming, milling operations.

19-19. **Parts Straightening Without Heat Treatment.** J. A. Chamberlin. *Aero Digest,* v. 44, no. 1, Jan. 1, '44, pp. 84, 88, 219.

Value of cold-straightening technique in salvaging of aircraft parts. Procedure whereby residual stresses produced by bending to point of permanent set and subsequent straightening out of part are evaluated to determine airworthiness.

19-20. **Shaping Metal Airframe Parts.** *Aircraft Production,* v. 5, no. 62, Dec. '43, pp. 566-571.

Drop-hammer, rubber die and stretch-pressing equipment at a deHaviland factory.

19-21. **The Wire Drawing Die.** Flint C. Elder. *Wire and Wire Products,* v. 19, no. 1, Jan. '44, pp. 23-33.

The tungsten carbide die as used in the dry drawing of steel wire of circular cross section as distinguished from shape wire.

19-22. **Drawing Fine Uncoated Steel Wire.** R. R. Preston. *Tool & Die Journal,* v. 9, no. 10, Jan. '44, pp. 117-119.

Successful drawing of fine uncoated steel wire depends on good dies and die maintenance; proper patenting; liming with correct grade of lime, proper baking and complete cleaning.

19-23. **Improved Tube Fabrication.** *Steel,* v. 114, no. 5, Jan. 31, '44, pp. 72-74.

Equipment used in the fabrication of parts from tubing, Duer Tube Bending Co., Chicago.

19-24. **Forging and Heat Treatment of Anti-Tank Shot.** R. M. P. *Machinery* (London), v. 63, no. 1628, Dec. 23, '43, pp. 709-714.

Methods used at Axelson Mfg. Co. in forging armour-piercing shot bodies and caps for 37-mm. projectiles used in anti-tank guns, along with various other munitions items.

19-25. **Manipulation of Light Alloy Sections.** J. Aherne-Heron and L. N. Hocking. *Aircraft Production,* v. 6, no. 63, Jan. '44, pp. 3-4.

A suggestion for an improved method by direct electrical heating. May be used for production bending.

19-26. **Aluminum at Trentwood.** T. J. Ess. *Iron & Steel Engineer,* v. 21, no. 1, Jan. '44, pp. 51-57.

First aluminum sheet mill west of the Mississippi River and one of the largest in the country, this plant was built in record time for DPC. With some variations for the metallurgy of the product, the practice is quite similar to the continuous production of steel sheets.

19-27. **Some Observations on Plate Mills.** W. A. White. *Iron & Steel Engineer,* v. 21, no. 1, Jan. '44, pp. 29-33.

The new plate mill of Kaiser Co., Inc., at Fontana, California, and some practical plate mill operating suggestions.

19-28. **New Brass Mill.** *Steel,* v. 114, no. 5, Jan. 31, '44, pp. 90-92, 114.

Innovations incorporated in a new brass mill constructed by Bridgeport Brass Co. at Indianapolis for the Ordnance Department, which increases speed and capacity.

19-29. **Light-Alloy Forgings.** *Aircraft Production,* v. 6, no. 63, Jan. '44, pp. 13-16.

Large-scale equipment used in a plant of the Chevrolet Division of the General Motors Corp. for cogging-down aluminum ingots to increase their tensile strength for the forging of aircraft-engine crankcase sections. Ingots heated in the furnace are transferred by the claw-ended boom on the carrier-mounted turntable to the cogging-down press. This press exerts a pressure of 3,000 short tons and reduces the section of the ingot from 12 by 12 in. to 9 by 9 in. A bank of tanks contains air and water under a pressure of 4,500 psi. for operating the hydraulic press.

19-30. **Aluminum Forging Practice.** *Steel,* v. 114, no. 5, Jan. 31, '44, pp. 76-80.

A study of the four phases of aluminum forging practice: Die design, metallurgical problems, inspection of raw materials, and standardization of test pieces.

19-31. **Auxiliary Plate Set System Accelerates Multiple Punching.** Frank H. Limburg. *Aero Digest,* v. 44, no. 2, Jan. 15, '44, pp. 130-132.

Any number of holes in an almost unlimited number of designs can now be perforated with one hit of the press with the Wales Plate Set Assembly. This consists of two plates, separated by spacer bars, the punches being held in the upper plate and the corresponding dies in the lower. This is located on the platen of a press, the work pushed in between the plates and the head of the press dropped to push all the punches through simultaneously. It is a development of the Wales-Strippit Corp.

19-32. **Forging 75-mm. Shell on Converted Rubber Presses.** Alan B. Salkeld. *Iron Age,* v. 153, no. 6, Feb. 10, '44, pp. 70-72.

High explosive shells are being produced by the pierce and draw method on rebuilt presses that were originally designed for much slower work in the rubber industry. With the exception of a rotary hearth

furnace, all the equipment used by this wire products plant was rescued from the scrap heap.

19-33. **The Use of Carbides for Press Work.** Athel F. Denham. *The Modern Industrial Press,* v. 5, Jan. '44, pp. 28-30.

Interrupted by the outbreak of the war and suspension of most commercial manufacturing, an important production development holding great promise for post-war use is in the field of application of carbides to the processing of sheet metal and other stamping and press operations.

19-34. **Tooling With Plastics.** Emric W. Berger. *Iron Age,* v. 153, no. 5, Feb. 3, '44, pp. 62-64.

A new thermoplastic material called Toolite has been found to be especially valuable for making hydropress form blocks because of its high compressive strength. It is also applicable to tool jigs and checking fixtures. Mixing the ingredients is like making cake batter and is done on identical commercial equipment.

19-35. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *The Modern Industrial Press,* v. 5, Jan. '44, pp. 25-26.

There are many advantages in blanking and forming multiple parts in punch presses. The next nearest approach, in the competition of producing cheap parts, is by casting them from foundry patterns. But even machine cast parts cannot be favorably compared with those made in dies. Cast parts lack the light weight, smooth appearance, and the low cost of parts made with dies.

19-36. **Crossroll Forging at Christy Park.** Arthur F. Macconochie. *Steel,* v. 114, Feb. 21, '44, pp. 80-82.

Forging weight reduced; redistribution of forging work; production; round slugs; flame cutting and sawing favored; slug diameter; rotary hearth furnaces.

19-37. **Drawbenches—Their Operation, Uses and Drives.** A. L. Thurman. *Steel,* v. 114, no. 7, Feb. 14, '44 pp. 124-128, 159.

Increasing demand for tubular shapes has brought the drawbench to the forefront. In this, the first of a series of three articles on this cold finishing unit, the author discusses various developments in design which have increased production, and cites effective means for loading mandrel, feeding material on rod and handling finished product.

19-38. **Drawbenches—Their Opeartion, Uses and Drives.** A. L. Thurman. *Steel,* v. 114, no. 8, Feb. 21, '44, pp. 94-96, 116-122.

Seamless tubes cold finished on drawbenches, the non-ferrous industry's use of tube benches and the newly developed continuous drawbench which finishes two tubes at once though it works four tubes most of the time.

19-39. **Small-Scale Sheet Steel Fabrication.** George Herrick. *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 208-210.

On-off methods in the home of quantity production.

19-40. **Recent Progress in Cold Drawing of Seamless Steel Tubes.** D. W. Rudorff. *Blast Furnace and Steel Plant,* v. 32, Feb. '44, pp. 227-231.

Plasticity and aging; maximum reduction; improvement in strength due to cold working; deformation efficiency; stressing percentage; deformability and resistance to creep. 7 ref.

19-41. **Safety in the Use of Metal-Working Drill Presses.** *Western Metals,* v. 2, Feb. '44, pp. 26-27.

Compilation from many sources taken from data sheets of National Safety Council, Chicago.

19-42. **Forming Aluminum.** Jerry Wilford. *Tool Engineer,* v. 13, Feb. '44, pp. 65-67.

Taking advantage of the "set" obtained by adding stretch to the bending of aluminum shapes, the Goodyear Aircraft Corp. has developed a machine for mass production which eliminates springback and handwork. Complete details and other data on aluminum forming progress are given.

19-43. **Design of Stampings to Facilitate Production.** Ralph A. Wagner. *Machinery,* v. 50, Feb. '44, pp. 171-174.

Detailed data on the design of stampings for quantity production, types of stampings made, materials used, and die design suggestions—fourth and last article.

19-44. **Heating Metals for Forging.** John Mueller. *Industrial Heating,* v. 11, Feb. '44, pp. 193-194, 196.

Forging furnaces; effect of furnace atmosphere; rate of heating; heating W and Mo steels; forging aluminum.

19-45. **Processing Steel Parts in Blanking and Forming Dies.** C. W. Hinman. *Steel Processing,* v. 30, Feb. '44, pp. 96-97, 113.

Construction details of the die; operation of the die; bending and forming.

19-46. **Hydraulic Presses for Post-War Metal Working Production.** *Steel Processing,* v. 30, Feb. '44, pp. 90-91.

Description of sheet metal forming equipment designed and built by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

19-47. **Forging Die Design.** John Mueller. *Steel Processing,* v. 30, Feb. '44, pp. 88-89.

Design of forging dies; production costs; die design with double impressions; group forgings.

19-48. **Metal Propeller Blades Precision Rolled on an Automatic Mill.** J. W. Smith. *Automotive & Aviation Industries,* v. 90, Feb. 15, '44, pp. 22-24, 170.

The automatic rolling mill is designed so that it will repeat any number of passes with precision registration at a predetermined reduction with the proper metal distribution at each station. Testing of a two-roller system with a roller replacing the longitudinal die disclosed that depth control of the metal in the groove was practically impossible. It was found that the roller and longitudinal die combination will produce any blade shape possible with the two-roller setup and in addition excels in all forms of precision cavity rolling.

19-49. **Lubrication in Deep Drawing.** Crowther, Liddiard and Marwood. *Iron Age,* v. 153, Feb. 24, '44, pp. 72-75.

Occurrences on die and metal surface in deep drawing and how lubrication is affected under pressures and temperatures encountered in this operation.

19-50. **Drawing of Fine Uncoated Steel Wire.** R. R. Preston. *Canadian Metals & Metallurgical Industries,* v. 7, Feb. '44, pp. 29-30.

Cleaning, lubrication and dies important.

19-51. **Drawbenches; Their Operation, Uses and Drives.** A. L. Thurman. *Steel,* v. 114, Feb. 28, '44, pp. 110, 112, 115, 130-133.

Characteristics of various drives and recommendations for choosing the most efficient type as well as control equipment.

19-52. **The "Know-How" of Drawing Aluminum.** *American Machinist,* v. 88, March 2, '44, pp. 88-89.

Satisfactory production of drawn aluminum shapes depends upon selecting material of the proper temper to withstand strain hardening, and observing certain simple rules in tool design. Five alloys are commonly used for drawn shapes; 2S, 3S and 52S are hardened only by cold working; 24S and 61S are heat treatable.

19-53. **Drop Hammer Dies for Short Production Runs.** *Automotive and Aviation Industries,* v. 90, March 1, '44, pp. 33, 58.

Drop hammer dies are made from a plaster mock-up of the part to be manufactured.

19-54. **Use of Forming Rolls in Skin Fabrication.** *Aero Digest,* v. 44, Feb. 15, '44, pp. 91-94, 96.

Universal-joint roll drive used. All three rolls are driven. Motor screw-down with independent control provided. Upper roll is located between the two lower rolls to prevent the skin from being pinched.

19-55. **Deep Drawing Practice and Technique.** Eugene E. James. *Modern Industrial Press,* v. 6, Feb. '44, pp. 37-38, 40.

Design of double action dies; use of Kirksite "A" as die material for draw die for the P-38 droppable tank.

19-56. **The Drawing of Fine Uncoated Steel Wire.** R. R. Preston. *Modern Industrial Press,* v. 6, Feb. '44, p. 32.

Cleaning after patenting, baking process, lubrication.

19-57. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, Feb. '44, pp. 20, 22.

Forged shells, machine trimmed to length and rough finished ready for nosing. Preparation for and description of nosing process.

19-58. **Automatic Control of Punch-Press Feed.** K. J. Steiner. *Metal Progress,* v. 45, March, '44, p. 510.

Application of a mercury switch has enabled one to hook up a relatively high speed straightener to a punch press requiring a slow supply of straightened strip.

19-59. **Accurate Press Work Essential in Making Propeller Spinners.** J. B. Alexander. *American Machinist,* v. 88, March 16, '44, pp. 94-96.

Blanking the propeller-blade openings in the "rear" shell of an aluminum spinner gives rise to certain problems in press-tool design and gaging.

19-60. **Automatic Forging of 90-Mm. Shells.** *Machinery* (London), v. 64, Jan. 27, '44, pp. 95-96.

Clearing automatic shell-forging machine that is an operation at the plant of the General American Transportation Corp., East Chicago.

19-61. **The Calculation of Roll Pressure In Hot and Cold Flat Rolling.** E. Orowan. *Institution of Mechanical Engineers,* v. 150, Feb., '44, pp. 140-167.

Graphical method for computing, in strip or plate rolling, the distribution of roll pressure over the arc of contact and the quantities derived from this (e.g., the vertical roll force, the torque, and the power consumption). The method avoids all mathematical approximations previously used in the theoretical treatment of rolling, and permits any given variation of the yield stress and of the coefficient of friction along the arc of contact to be taken into account. It can be used in both hot and cold rolling. 16 ref.

19-62. **Stretch Forming Aircraft Parts.** R. H. Ruud. *Iron Age,* v. 153, March 9, '44, pp. 54-60.

A method of stretching with a die made to the exact shape and contour of the finished part, and includes much valuable data on physical properties of stretched material.

19-63. **Light Alloy Pistons.** C. Wilson. *Automobile Engineer,* v. 34, Feb. '44, pp. 53-58.

The materials for highly stressed wrought and forged pistons surveyed, and the influence of fabrication methods considered. Individual forging of cast blanks and its relation to grain flow studied and typical test results given. The importance of grain flow is stressed, particularly as it influences the maintenance of a constant quality in the product.

19-64. **Making "Spring Grade" Beryllium Copper Wire.** F. S. Stickney. *Wire & Wire Products,* v. 19, March '44, pp. 169-172.

Raw material inspection, the "silvercote" process, final inspection.

19-65. **Flow of Steel in Upsetter Forging.** Arthur F. Macconochie. *Steel,* v. 114, March 13, '44, pp. 90-91, 132.

Manufacture of forgings in the upsetter. The general tendency is to emphasize the original pattern in the bar, and thus to strengthen the finished shell in the lengthwise direction. Strength in the axial direction is particularly important immediately underneath the rotating band, where the section is weakest and least able to resist the pressure of inertia.

19-66. **Precision Thread Rolling With Flat and Cylindrical Dies.** Holbrook L. Horton. *Machinery,* v. 50, no. 7, March '44, pp. 158-169.

Large quantities of screws and studs are being thread-rolled to meet the exacting standards of the aircraft engine industry. High production, increased tensile strength, and superior surface finish are advantages of this process.

19-67. Jessop Steel Company Puts New 18-in. Mill on Production. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 32, no. 3, March '44, pp. 331-333, 342.

Description of bar mill, billet heating furnaces, and the mill drive.

19-68. A Production Line Method for Making Punch Press Dies. S. W. Bower. *Steel,* v. 114, March 27, '44, pp. 84-85, 128, 130.

Pierce blank template is used in the shop as a punch press die for stamping flat parts from aluminum alloy sheet or strip material.

19-69. Deep-Drawing Domes. L. E. Browne. *Steel,* v. 114, March 20, '44, pp. 86-87, 131, 132.

Selection of lubricants, special lubricating mix used; strong caustic cleaners avoided.

19-70. Straightening Light-Alloy Sections. *Aircraft Production,* v. 6, March '44, pp. 107-110.

Special purpose Head-Wrightson stretching and de-twisting equipment.

19-71. Pressed Aircraft Pistons. *Aircraft Production,* v. 6, March '44, pp. 139-142.

Heat treatment; laboratory control; advantages of the pressing process.

19-72. Operating Economy of Pneumatic and Steam Forging Hammers. F. Knorr. *Engineers' Digest,* v. 1, March '44, pp. 211-213.

Performance and operation.

19-73. Planned Grain Flow in Forgings. Waldemar Naujoks. *Metals & Alloys,* v. 19, March '44, pp. 590-592.

Explanation of the origin and development of the flow lines or fibre structure to which forgings owe so much of their high strength and serviceability. Stresses the importance of designing the part and planning the forging operation so that optimum positioning of the grain flow will result.

19-74. Processing Parts from Strip Steel in Progressive Dies. C. W. Hinman. *Steel Processing,* v. 30, March '44, pp. 162-164.

Layout of the die blocks and punches for a three-station progressive die that produces the channel clip.

19-75. Dies for Drop Forging. E. W. Mace. *Steel Processing,* v. 30, March '44, pp. 154-155.

Multi-impression drop forging dies.

19-76. Stretch-Forming Double-Curved Sheet-Metal Parts. R. B. Glassco and N. O. Myklestad. *Steel Processing,* v. 30, March '44, pp. 168-171, 177-178.

(See No. **19-91.**)

19-77. Popularity of Forged Aircraft Parts. H. L. Showalter. *Aero Digest,* v. 44, March 1, '44, pp. 127, 129, 199.

Advantages of forging; properties of impact die forgings.

19-78. The Two-Jaw Chuck Applied to Drop Forgings. "S." *Machinery* (London), v. 64, March 9, '44, pp. 269-270.

Adaptability of the two-jaw chuck for holding safely and accurately drop forgings of irregular form.

19-79. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, March-April, '44, pp. 24-26.

Design for a progressive die; principles of design and construction; feeding progressive dies.

19-80. **Cold Roll Forming Machines.** George Kentis. *Modern Industrial Press,* v. 6, March-April '44, pp. 28, 30.

Cold roll forming of beads and sharp corners.

19-81. **Relative Scopes of Hydro-Press Forming with the Master Rubber Pad.** Gordon B. Ashmead. *Modern Industrial Press,* v. 6, March-April '44, pp. 45-48.

The Guerin Process.

19-82. **A Pipe Bending Success Story.** G. E. Healy and D. M. Johnston. *Industrial Gas,* v. 22, April '44, pp. 19, 41-42.

Pipe, 4 in. in diameter and over, receives what is known as "hot bends," while smaller pipe, on extra-short-radius bends, is filled with resin to prevent flattening and is bent cold. Larger radius bends require no filling. Gas heat is used even in the cold short-radius bends.

19-83. **Production Problems of Exhaust Collector Rings.** Eric O. Johnson. *Automotive Industries,* v. 90, April 1, '44, pp. 24-27, 56.

How to adapt extensive mass production equipment for die-pressing and deep-drawing such pre-war articles as refrigerator cabinets, kitchen sinks and certain automobile body parts to the production of collector rings.

19-84. **Cold Reduced Strip Steel.** Paul J. McKimm. *Steel,* v. 114, April 3, '44, pp. 132-134, 170.

Slight roughness on surface of strip affords the use of higher annealing temperatures, reduces friction in forming operation and improves adhesion of coatings. Changes in physical characteristics of low carbon steel as a result of cold rolling and type of heat treatment employed to restore values.

19-85. **Methods for Forming Sheet Aluminum.** *Aviation,* v. 43, April '44, pp. 150-152, 276.

Manufacturing processes and formulas used by one of America's leading industrialists.

19-86. **Stretch-Bend Unit Simplifies Metal Work.** J. S. Nielson and C. B. Mitchell. *Aviation,* v. 43, April '44, pp. 155, 253, 255.

New machine saves manpower and lowers costs in forming strips, extrusions, and bent-up sections.

19-87. **The Drawing of Synthetic Fibers.** S. Coppick. *Wire & Wire Products,* v. 31, April '44, pp. 238-241, 253.

Drawing synthetic fibers. Analogies between the fiber and wire drawing industries. Both of these industries are faced with the same problem, i.e. the unidirectional extension of matter.

19-88. **Upset Forging on a Welder.** D. B. Wilkin. *Steel,* v. 114, April 17, '44, pp. 94-97, 100, 102.

New process now being employed by Cleveland

Pneumatic Tool Co. in making trunnion pins for aircraft landing gears. Production costs are reduced 56%.

19-89. **Eastern Wire-Strip Mill Now in Production.** *Steel,* v. 114, April 17, '44, pp. 116-118, 142.

Round and shaped steel wire and strip products weekly produced at American Steel & Wire Co., Worcester, Mass. Machinery, equipment and processing facilities are designed so that the highest quality production of steel and wire products is effected. Engineering and operating plans have allowed for the addition of auxiliary and supplementary equipment to keep pace with the future research and development in the various phases of steel production.

19-90. **Reclaiming 75-Mm. A. P. Shot by Forging.** Charles C. Barrenbrugge. *Iron Age,* v. 153, April 13, '44, pp. 71-73.

75-mm. M72 solid shot made into the more deadly 75-mm. M61 carrying an explosive charge. Re-forging made it possible to convert this shot without waste of material and eliminated many machining operations.

19-91. **Analysis of Stretch-Forming Double-Curved Sheet-Metal Parts.** R. B. Glassco and N. O. Myklestad. American Society of Mechanical Engineers *Transactions,* v. 66, April '44, pp. 161-168.

Double-curved surfaces are classified according to direction of curvature. A qualitative stress analysis is made of stretch-forming (process of clamping metal sheet at two opposite edges and forcing a punch into the taut sheet) each class of surface, with special reference to the stress transverse to the direction of restraint. It is shown that there are two distinctly different sources of transverse stress during stretching.

19-92. **Bending Preformed and Extruded Sheet-Metal Sections.** Thomas T. Tobin. *Machinery,* v. 50, April '44, pp. 139-145.

Use of wrap-forming and cam-bending machines to give proper contours to airplane structural members of extruded and preformed shapes.

19-93. **How to Secure Fine Surface by Grinding. XI** H. J. Wills and H. J. Ingram. *Machinery,* v. 50, April '44, pp. 159-161.

Machine lapping operations.

19-94. **Rolling Alloy Steels in Canada on Combination 26 and 22-In. Mills.** R. G. Drinnan. *Blast Furnace & Steel Plant,* v. 32, April '44, pp. 443-447.

The 2-high 26-in. reversing mill, the 3-high morgan 22-in. mill, advantages of the combination mills, general plant layout and equipment.

19-95. **Unique Die Sets.** G. Eldridge Stedman. *Steel,* v. 114, April 24, '44, pp. 106, 108, 132, 134.

Feature multiplicity of slides, cams, punches and the like to produce at one operation many complicated parts for electrical switchboards; permit vertical press to handle wide range of metalworking operations.

19-96. **Charts Simplify Punch Press Loading.** D. E. Hayes. *American Machinist,* v. 88, April 27, '44, pp. 108-110.

Quick reference form makes it easy to determine tonnage required for blanking. A chart listing press specifications is also used for proper loading.

19-97. **5000 Ton Press Turns Out 24,000 Aircraft Parts Daily.** *Steel*, v. 114, May 1, '44, pp. 106, 108.

Average production of 24,000 aircraft parts every 24 hours from a 5000-ton hydraulic press equipped with four motorized loading carriages or tables which make the operation practically continuous.

19-98. **Cast Kirksite Blanking Dies.** *Iron Age*, v. 153, May 4, '44, pp. 56-59.

Cast zinc alloy dies are being used successfully with steel template blanking punches at North American Aviation, Inc. For temporary tooling, both halves of the set are screwed to universal die shoes. Pierce and blank template dies are made by casting Kirksite onto a keyed backing plate. This is a modification of the technique of making pierce, blank template dies out of tooled Kirksite.

19-99. **Continuous Cold Drawing Machines.** *Iron Age*, v. 153, May 4, '44, p. 66.

Basic principles and practices of cold drawing have been retained, but have been elaborated upon to obtain a continuous cycle in what has heretofore been an intermittent operation.

19-100. **The Modern Plate Mill.** *Iron and Steel Engineer*, v. 21, April '44, pp. PM 18-21.

Tables showing location, number of stands, type, roll drain and length, gauges, maximum width, annual capacity, drive-type, horse power and rpm; rpm of rolls.

19-101. **Recent Plate Mill Developments.** R. E. Noble. *Iron and Steel Engineer*, v. 21, April '44, pp. PM 23-47.

Production statistics, types of mills, component parts of the plate mill plants, 160-in. single stand mill with scale breaker; description of Steel Co., of Canada, Tennessee Coal, Iron, and Railroad Co., Kaiser Co., South Africa Iron and Steel Industries Corp., National Steel Co. of Brazil. 132-in. semi-continuous mill.

19-102. **Plate Rolling Practice.** Louis Bunting and T. T. Watson. *Iron and Steel Engineer*, v. 21, April '44, pp. PM 48-51, 71, 72, 75.

Mill description, practice, ingot provision, yields, descaling.

19-103. **Observations on Plate Mill Rolls.** Louis Moses. *Iron and Steel Engineer*, v. 21, April '44, pp. PM 54-56.

Study of roll spallage and the reasons therefor.

19-104. **The Use of Carbides for Press Work.** *Machine Tool Blue Book*, v. 40, May '44, pp. 155-156, 158, 160, 162, 164, 166.

Carbide's tremendously high abrasion resistance and consequent ability to hold close limits and maintain high finish, multiplies die life many times.

19-105. **Forging Die Design.** John Mueller. *Steel Processing*, v. 30, April '44, pp. 217-218.

"Die lock," what it is, how to design dies to take care of this factor and different points the designer must consider in laying out the die.

19-106. **New Developments in Metals in Production of Stampings.** *Steel Processing,* v. 30, April '44, pp. 219-221.

The economics of the use of stamped, drawn and pressed metal.

19-107. **Stretch - Forming Double - Curved Sheet - Metal Parts.** R. B. Glassco and N. O. Myklestad. *Steel Processing,* v. 30, April '44, pp. 222-224.

Mathematical development of forming of saddle-back part from sagging sheet. (See No. 19-91.)

19-108. **Fabrication of Hollow Steel Propeller Blades.** *Steel Processing,* v. 30, April '44, pp. 228-231, 243.

Fabricating hollow steel propeller blades is a difficult and intricate process. Each blade undergoes almost 100 separate operations in its manufacture, and inspection is very thorough to insure against failure in operation.

19-109. **Forging Forks for Farmers.** W. K. Cowdery. *Steel,* v. 114, May 8, '44, pp. 98-99, 106.

An unusual combination of hand and mechanical methods.

19-110. **Hydraulic Device Improves Stretch Forming.** *Aero Digest,* v. 45, April 15, '44, pp. 106, 108.

Forming aircraft metal parts by stretching them at the same time they are being bent to shape is being accomplished with a simple light machine consisting of a small rotatable table and hydraulic cylinder and piston mounted on a base.

19-111. **Manipulation of Light Alloy Sections.** J. Aherne-Heron. *Engineers' Digest,* v. 1, April '44, pp. 279-280.

Current up-to-date methods employed for forming extruded light alloy sections for airframe construction include contour rolling, press-forming, and normal hand-forming over jigs.

19-112. **Operating Economy of Pneumatic and Steam Forging Hammers.** F. Knorr. *Engineers' Digest,* v. 1, April '44, pp. 287-288.

Factors which are decisive upon operating economy.

19-113. **Design and Production Technique, III.** A. J. Schroeder. *Aircraft Engineering,* v. 16, March '44, pp. 83-88.

Principles involved in punching.

19-114. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, May '44, pp. 20, 22.

Miscellaneous dies and press equipment.

19-115. **Economy in Blanking.** Sergius D. Brootzkoos. *Modern Industrial Press,* v. 6, May '44, pp. 24, 26.

Sheet metal articles and parts are mostly stamped, formed or drawn from cut flat pieces of metal or blanks, as they are called by the trade. These blanks are either cut in a separate operation, or the blanking operation is combined with a drawing or a forming operation.

19-116. **Goodyear Develops Machine to Speed Up Production of Metal Parts for Aircraft.** *Modern Industrial Press,* v. 6, May '44, pp. 28-30.

Industry's need for quick, economical and large-scale production of metal parts has been met by a machine called a roto stretcher.

19-117. **Draw Die Materials.** Gordon B. Ashmead. *Modern Industrial Press,* v. 6, May '44, p. 32.

Draw dies are successfully made from wood or steel and a wide range of materials in between these two.

19-118. **Designing Joggles for Sheet-Metal Assemblies.** Frank M. Mallett. *Product Engineering,* v. 15, May '44, pp. 338-339.

Sheet-metal assemblies require fitting a member to two parallel surfaces not in the same plane; the forming necessary to make a proper fit is called joggling and the part is said to have a joggle. This makes a part more expensive, but if it results in better fits the saving in assembly expense more than makes up the increased cost of the part.

19-119. **The Ancient Art of the Gold Beater.** Joseph Danforth Little. *Metal Finishing,* v. 42, May '44, pp. 272-275.

History of the art.

19-120. **Mass Production Metal-Forms.** Fred P. Peters. *Scientific American,* v. 170, May '44, pp. 199-201, 235.

In materials engineering, the choice of metal-form or fabricating method is often as important as selecting the metal to be used. Process-competition in the small-parts field is especially intense and will become more so in the not far distant future.

19-121. **Salvaging Mandrels.** G. H. Henshaw. *Steel,* v. 114, May 15, '44, pp. 108, 111.

Willys-Overland rebuilds worn equipment by spraying with metal and grinding to proper size, saving 20 cents per shell.

19-122. **Western Cartridge Co.'s New Brass Mill Features Straight Line Production.** G. Eldridge Stedman. *Steel,* v. 114, May 15, '44, pp. 114-116, 118.

Prior to hot rolling, the slabs are heated in gas-fired pusher-type furnaces. After hot rolling, the material is passed through a 9-roll straightener; next through a slab miller to remove possible surface defects; then turned over and passed through a second miller to treat the other side. The material then is ready for the tandem mill. Tandem mill cold reduces the semi-finished material in two passes.

19-123. **What the Product Designer Should Know About Hot-Heading.** A. E. R. Peterka. *Machinery,* v. 50, May '44, pp. 172-177.

Sizes adapted for hot heading, relative cost of hot and cold heading dies a governing factor, advantages and limitations of cold and hot heading.

19-124. **Shrink-Fit Assembly of Cylinders Is Done on a Special Press.** *American Machinist,* v. 88, May 11, '44, pp. 101-102.

Uniform results in assembly of Allison cylinder banks arises from use of a hydraulic press that simultaneously pushes six refrigerated steel barrels into a heated aluminum head casting.

19-125. **Novel Methods Speed Manufacture of M3 Submachine Gun.** *American Machinist,* v. 88, May 11, '44, pp. 109-116.

Weapon is fabricated almost entirely of stampings and screw machine parts at the Guide Lamp Division of General Motors. Barrels are made from seamless tubing and rifling grooves are formed by a press operation.

19-126. **Device for Calculating Wire Mill Problems.** E. H. Webb. *Wire and Wire Products,* v. 19, May '44, pp. 291-293.

Calculator used in connection with a new wire gage, based on the equal reduction in sectional area between each wire gage number.

19-127. **Cold Rolling of Narrow Strip and Its Equipment Requirements.** R. J. Wean. *Wire & Wire Products,* v. 19, May '44, pp. 295-298, 317.

Historical data furnished by the Broden Construction Co.

19-128. **Glass Processing Wire and Steel Products.** John J. Caugherty. *Wire and Wire Products,* v. 19, May '44, pp. 299-303.

Methods to eliminate the use of acids in cleaning methods, improve the quality, increase production, at reduced costs, and save in metal loss. The new methods cover hot rolling, cold drawing, galvanizing, and heat treatments, such as annealing, patenting, etc., with de-oxidation in one continuous operation.

19-129. **Supervisory Control for the World's Most Modern Steel Mill.** P. B. Garrett and M. E. Reagan. *Electrical Engineering,* v. 63, May '44, pp. 259-264.

Details of operation; transfer switches; control lines; supervisory versus direct-wire control; motor-room control; regulator control for the structural-steel mill; no-alarm feature; miscellaneous supervision features; rectifier control; rectifier protection, step-regulator control; tie substation alarm features; pilot channel supervision; door-lock supervision; blackout.

19-130. **How to Wrinkle-Bend Non-Ferrous Pipe & Tube. I.** *Industry & Welding,* v. 17, May '44, pp. 51-54, 56.

Method and advantages of wrinkle-bending copper and brass pipe.

19-131. **Bar Mill Gives to Copperweld Steel Company Greater Flexibility of Operation.** Charles Longenecker. *Blast Furnace & Steel Plant,* v. 32, May '44, pp. 547-550.

Bloom conditioning, the furnace, the 21-24-in. mill, finishing department.

19-132. **Magnesium Sheet Easily Formed When Simple Precautions Are Observed.** W. G. Harvey and J. B. West. *American Machinist,* v. 88, May 25, '44, pp. 105-108.

The factors that affect workability of magnesium alloy sheet are: Magnesium alloys must be heated to withstand severe bends, deep drawing, spinning, and other relatively difficult forming operations; thin sheet, heated for forming, may cool rapidly during forming; in many cases, when cold forming magnesium alloys, greater spring-back may be experienced than with aluminum; the capacity of magnesium alloys for cold working is far less than that for comparable aluminum alloys.

19-133. Deep Drawing of Formed Parts for Flying Fortresses. B. K. B. *Machinery* (London), v. 64, April 6, '44, pp. 365-369.

Use of deep-drawing dies for shaping formed parts required in the construction of airplanes. Handicaps encountered, maintenance of shape; die design.

19-134. Ordnance Components Mass-Produced by Pressed-Metal Technique. C. F. Greeves-Carpenter. *Machinery* (London), v. 64, April 6, '44, pp. 380-381.

Developments in the pressed-metal industry point the way for new designs, better construction and lower cost products in post-war production.

19-135. Tools for Producing a Sheet Steel Pressing. W. Danks. *Machinery* (London), v. 64, April 6, '44, pp. 382-384.

Lock pressing from 3/32-in. steel sheet, pierced to suit an opposite part with which it has subsequently to be assembled, and bent up to a shallow channel form produced accurately and economically in two simple press operations, by first piercing and chopping off, and by subsequently bending to form.

19-136. Forming of Magnesium Alloys. Paul Hawley. *Western Metals,* v. 2, May '44, pp. 28-29.

Use of magnesium alloys in the design of aircraft structure and forming of sheet magnesium alloy.

19-137. Spinning Metals for Better, Cheaper Products. *Modern Industry,* v. 7, May 15, '44, pp. 76, 79-80, 83.

Metals now spun successfully include aluminum and aluminum alloys, magnesium, brass, bronze, copper, steel and steel alloys, nickel and nickel alloys, lead, pewter and zinc. Others, not so commonly used, are gold, silver, platinum, kovar, invar, and illium.

19-138. Forging and Fabricating 1000-Pound Semi-Armor Piercing Bomb. Gerald Eldridge Stedman. *Steel Processing,* v. 30, May '44, pp. 285-288, 324.

Method of making 1000-lb. semi-armor piercing bombs at plant of Darby Corp., Kansas City. The sequence of operations in processing these bombs together with background information on this company as to what can be expected from it in the future industrial expansion of this area.

19-139. Processing Steel Shells. C. W. Hinman. *Steel Processing,* v. 30, May '44, pp. 292-294.

A combination blank and draw die, piercing the circle of holes, peculiar advantages of the die, the piercing die in operation.

19-140. Contoured Cavity Method of Forging Large Shells. *Steel Processing,* v. 30, May '44, pp. 295-296.

Description and advantages of the new method.

19-141. Aging and the Yield Point in Deep Drawing Steel Sheets. J. R. Low and M. Gensamer. *Steel Processing,* v. 30, May '44, pp. 302-306.

Experiments to determine which of the commonly suspected elements is responsible for aging or the yield point by putting carbon, nitrogen and oxygen back into hydrogen-treated sheets and determining whether or not aging and the yield point reappear, arranging the

experiment to ensure the introduction of only one element at a time.

19-142. **Automatic Precision Taper Rolling.** John W. Smith. *Steel,* v. 114, May 22, '44, pp. 90, 92.

Automatic precision die rolling for propeller blades.

19-143. **Wire Rope.** G. Eldridge Stedman. *Steel,* v. 114, May 22, '44, pp. 104-106, 108, 111.

Life of wire rope is influenced by many factors. Abuses to which it is subjected during installation create hazards. Steps involved in drawing and stranding wire and in closing strands into rope.

19-144. **Roll More Tons—VII.** A. E. Lendl. *Iron & Steel,* v. 17, April '44, pp. 313-318.

Calibrations of flat-bottom rail sections.

19-145. **Tubular Railway Axles.** *Iron & Steel,* v. 17, April '44, pp. 343-344.

Pilger process, forging, finishing operations, large weight saving, less rail hammer.

19-146. **Header Manufacture.** *Iron & Steel,* v. 17, April '44, pp. 345-346.

Recent improvements in heating and forging.

19-147. **Contour Forming of Extrusions and Preformed Sections by Stretching.** Jack Johnson. *Automotive Industries,* v. 90, May 15, '44, pp. 22-25, 214.

The stretch forming of airplane parts to contour is a forming method which, while greatly simplifying the making of parts often difficult to form by other methods, entails relatively little tooling cost.

19-148. **Designing Sheet-Metal Parts for Production.** Frank M. Mallett. *Machine Design,* v. 16, May '44, pp. 103-108.

Formability of the sheet-metal parts for the airplane. Possible deformation affected by tools; forming of beads for stiffening. 16 ref.

19-149. **Deep Drawing a Wide Flanged Cylindrical Shell.** Eugene E. James. *Modern Industrial Press,* v. 6, May '44, pp. 37-38, 40.

Estimates given on the cost of draw dies to be amortized over the scheduled number of parts versus present metal spinning method. As a result of these estimates the dies were ordered, designed and built.

19-150. **The Effect of Rolling Temperature on the Mechanical Properties of a Magnesium Alloy.** W. R. D. Jones. *Institute of Metals Journal,* v. 11, April '44, pp. 149-158.

Effect of rolling temperature and subsequent annealing on the mechanical properties of a Mg alloy. 16-gauge sheets were rolled at various temperatures from 1-gauge sheets which had been produced by hot rolling cast slabs and also slabs that had been extruded from a chill-cast circular ingot, teemed from the same ladle of molten alloy. It is shown that by hot rolling direct from cast slabs sheets can be produced which have properties at least equal, if not superior, to those produced from extruded slabs. Sheets rolled at 400° to 450° C. are self-annealing. Two rolling procedures may be recommended for the production of sheets with

optimum mechanical properties: Either (1) rolling at 400 to 450° C., or (2) rolling at any temperature above 200 and below 400° C., followed by annealing at 300° C. 2 ref.

19-151. **60 Mm. Mortar Shell Production Technique.** Harry M. Heckathorn. *Iron Age,* v. 153, May 25, '44, pp. 42-44.

Pressing technique devised at the Mullins plant in order to avoid forging, machining and casting operations; production of 60-mm. mortar shells could rapidly be increased.

19-152. **Stamping Precision Gears.** G. Eldridge Stedman. *Steel,* v. 114, May 29, '44, pp. 82-83.

Many kinds of gears are made by improved stamping methods with such accuracy that backlash in gear trains is held to extremely close limits. Precision shaving and careful press "make ready" prove key to successful production.

19-153. **Flame - Spinning Process.** Thomas McElrath. *Steel,* v. 114, May 29, '44, pp. 84-85.

For closing tube ends now being used extensively in manufacture of war goods. Appears to be established as permanent and economical fabrication method.

19-154. **Formed Stellite Reflectors for the Navy.** Henry G. Horner. *Metals & Alloys,* v. 19, May '44, pp. 1129-1132.

Description of the use of ultra-hard non-ferrous alloys of the Stellite type for large Navy searchlight reflectors and the attendant development of methods of hot-rolling, hot-forming and finishing. Service requirements, the fabricating and finishing operations and the inspection methods involved in this application.

19-155. **Airplane Tank Demonstrates Forming of Magnesium Sheet.** W. G. Harvey and J. B. West. *American Machinist,* v. 88, June 8, '44, pp. 102-104.

Production rates for parts made from magnesium are comparable to those for aluminum articles when certain precautions are observed in design of press tools and the application of heat.

19-156. **Carbine Sight Made from Brazed Stampings.** *Iron Age,* v. 153, June 1, '44, pp. 47, 134.

Front sight for the cal. 0.30 carbine is now being made from rolled and stamped pieces that are brazed together instead of being machined from a solid forging. Cost is 45c, compared with 85c for the forging. Only press dies and forming equipment are needed for the re-designed sight.

19-157. **Improved Explosive Rivet.** *Steel,* v. 114, June 5, '44, p. 130.

Helps plane builders to meet heavier schedules yet seeks a future on assembly lines for consumer appliances.

19-158. **A-C and D-C Drives for Draw Benches and Wire Blocks.** R. A. Geuder. *Iron & Steel Engineer,* v. 21, May '44, pp. 47-56.

Electrical equipment for draw benches and wire blocks varies with production requirements, power

supply, flexibility, first cost and plant policies. The pros and cons of the various systems.

19-159. **Bloom and Billet Mills and Their Rolls.** F. C. T. Daniels and D. L. Eynon. *Iron & Steel Engineer,* v. 21, May '44, pp. 79-91.

Layouts of blooming and billet mills of various types with typical roll passes, and roll applications in these mills.

19-160. **New Developments in Forging Ferrous and Non-Ferrous Metals.** R. W. Thompson. *Iron Age,* v. 153, June 8, '44, pp. 54-57.

The rapid rise in the use of both ferrous and non-ferrous forgings has resulted in many new production problems. As a guide to these newcomers in this field, the author explains the different classes of forgings and describes methods for producing them.

19-161. **Precision Corrugation Dies.** James Walker and Carl C. Taylor. *Tool Engineer,* v. 13, June '44, p. 85.

Construction of a set of corrugation dies for 24S-T aluminum alloy, 0.040 in. thick, which will hold a 1½-in. center distance between two individual corrugations 48 in. apart, within plus or minus 0.020 in.

19-162. **Heavy Plate Sections.** R. L. Hartford. *Steel,* v. 114, June 12, '44, pp. 98-99.

Sections measuring up to 36 ft. long are readily formed on shop-built press. Novel press designed and built by Fort Pitt Bridge Works, Canonsburg, Pa.

19-163. **Forging Shot Caps with Gas.** A. D. Wilcox. *Industrial Gas,* v. 22, June '44, pp. 11-12.

Use of gas aids in production of a forging slug free of detrimental scale.

19-164. **Built-Up "Spinners."** G. Eldridge Stedman. *Steel,* v. 114, June 19, '44, pp. 86-88, 142, 144, 146.

Cut costs 50%; employ unique refabrication method by which parts are drawn after welding. This method is expected to increase the use of sheet steel in the production of many types of hollow shapes.

19-165. **Cam Type Forming Die.** S. E. Fishman and G. A. Keating. *Tool & Die Journal,* v. 10, June '44, pp. 91-93.

Development of a cam-type mechanical forming die, capable of drawing a 147½° closed angle flange around a 1½-in. radius without wrinkling or cracking.

19-166. **Molding and Fabricating Methods.** Warren V. Prince. *Tool & Die Journal,* v. 10, June '44, pp. 105-112.

Compression molding, injection molding of thermoplastic materials, injection molding of thermosetting materials—("jet" molding), transfer molding, high frequency heating, extrusion, drawing, casting, cold molding, laminating (high pressure and low pressure), blow molding, swaging, forming, shaping, calendering, stamping, machining, cementing, welding, coating, impregnating, metal plating of plastics.

19-167. **Forged Cylinder Heads Require New Technique.** *Aviation,* v. 43, June '44, pp. 142-145, 248, 251.

How Wright Cyclone cylinder heads are cut out of a solid block.

19-168. **Methods for Forming Sheet Aluminum.** *Aviation,* v. 43, June '44, pp. 154, 159, 253, 255-257.

Specific examples showing ways of forming circular aircraft parts without resorting to the expense of dies or heavy drop presses.

19-169. **Introducing Essex Wire of California.** *Western Metals,* v. 2, June '44, pp. 18-20, 23-24.

New copper drawing and magnet wire plant at work.

19-170. **Safe Practices in Working Magnesium.** Arthur C. Stern and Charles B. Ford. *Iron Age,* v. 153, June 22, '44, pp. 64-70.

Approved safe practice recommendations for the prevention and control of fire and explosion hazards in magnesium alloy fabrication plants. Occupational health hazards that may exist in magnesium foundries from the presence of atmospheric contaminants such as fluorides, sulphur dioxide, carbon tetrachloride and chromium compounds. 12 ref.

19-171. **"Contoured-Cavity" Forging Method Developed for Large Caliber Shells.** *Industrial Heating,* v. 11, June '44, pp. 877-878, 880, 882.

General aspects of this method.

19-172. **Heating and Rolling in Bar Mills.** J. L. McHugh. *Industrial Heating,* v. 11, June '44, pp. 928, 930, 1020.

Heating furnaces and equipment, rolling mill equipment.

19-173. **The Design of Stampings for Quantity Production.** R. A. W. *Machinery* (London), v. 64, May 4, '44, pp. 487-491.

Details of stamping design. Drawn or formed notched parts. Locating holes in stamping design. Extruded holes in stampings. Lanced holes, louvres.

19-174. **Convair's New Tooling Plastic.** Thomas A. Dickinson. *Aero Digest,* v. 45, June 1, '44, pp. 100-101, 220.

A cold-pour, thermosetting cast phenolic plastic with filler added. It was created specifically to replace steel, aluminum, dural, and Kirksite in the making of hydropress form blocks, stretch forms, sinking dies, drill jigs, checking fixtures, lathe fixtures, and other machine tools used in the production of aluminum parts.

19-175. **Rolled Threads for Aircraft Engine Parts.** Franklin M. Reck. *Aero Digest,* v. 45, June 1, '44, pp. 114, 116.

Increasing use of rolled threads for aircraft engine studs, bolts, and capscrews should save considerable production time in the future.

19-176. **Efficient Die Operations.** *Steel,* v. 115, July 3, '44, pp. 86-87, 104, 126, 128.

Permit 600-ton load in punching 29 holes to be handled on 225-ton press in landing mat production line. For blanking out aircraft engine mounting rings, 115 in. of lineal cut are made in ½-in. steel plate on 700-ton press, a job ordinarily requiring 1150 tons.

19-177. **The Production of the 0.50-In. Ammunition Link.** *Machinery* (London), v. 64, May 11, '44, pp. 505-512.

Automatically controlled operations on multi-operation presses.

19-178. **Bar and Tube Straightening.** Walter Siegerist. *Iron & Steel Engineer,* v. 21, June '44, pp. 35-44, 63.

Straightening requires the neutralization or balancing of all stresses in the bar. This necessitates bending in the reverse direction to a degree sufficient to exceed the elastic limit in the outer fibers. The methods and equipment for straightening are discussed.

19-179. **Developments in Steel Mill Bearings.** H. L. Smith. *Iron & Steel Engineer,* v. 21, June '44, pp. 64-65.

Lead-base babbitts containing arsenic have been substituted for tin-base alloys with satisfactory results. A method of repairing bearings in bronze, steel or cast iron shells.

19-180. **Shell Forging.** M. D. Stone. *Steel Processing,* v. 30, June '44, pp. 353-354, 382-383.

Metal flow and associated forces.

19-181. **Lubrication of Metal Forming Machinery.** *Steel Processing,* v. 30, June '44, pp. 368-369, 384.

Equipment consists of four centralized lubricating systems designed for application to small, medium, and large heavy duty machinery as well as to large batteries of machinery where it is desirable to lubricate hundreds of bearings from a central point.

19-182. **Aging and the Yield Point in Deep Drawing Steel Sheets.** J. R. Low and M. Gensamer. *Steel Processing,* v. 30, June '44, pp. 372-373.

Bibliography of 100 references.

19-183. **Anderson Aluminum Forge Plant.** Joseph Geschelin. *Automotive Industries,* v. 90, June 15, '44, pp. 22-25, 102.

Operated under supervision of the Chevrolet Mfg. plant in Muncie, Ind., first of the division's units to get into volume production of aluminum forgings with forging presses.

19-184. **Rolling Mills for Light Alloys.** *Engineers' Digest,* v. 1, June '44, pp. 404-406.

Formula used in fixing the sizes of rolls, housings, bearings, screws; determination of housings and roll diameters in cold rolling.

19-185. **Forging Shot From Alloy Bar Stock.** G. Eldridge Stedman. *Steel,* v. 115, July 3, '44, pp. 106-108, 110, 113.

Kansas City Plant—first in the United States to use cupola-melted scrap in the form of hot metal with cold charge in the open-hearth—swings on to production of armor-piercing shot steel early in 1942. Unique procedure for producing the forgings is employed.

19-186. **Post-War Reorganization.** Norman F. Dufty. *Iron & Steel,* v. 17, May '44, pp. 360-362.

Out-of-date mills, Talbot and arc furnaces, eliminate old plants, arc furnace as refiner, brakes on progress, success despite handicaps, a National Metallurgical Laboratory.

19-187. **Contoured - Cavity Shell Forging.** *Metals & Alloys,* v. 19, June '44, pp. 1402-1404.

Advantages of the contoured-cavity method over the straight cavity method.

19-188. **Riveting of Airplane Spars by Presswork at Ford Plant.** P. D. Aird. *Modern Industrial Press,* v. 6, June '44, pp. 20-22, 32.

Adaptation of the press to meet the new demand was comparatively simple. The plastic feeding mechanism was cut off and the press was fitted to operate as a simple hydraulic press, operating on a pressure cycle of 2½ sec.

19-189. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, June '44, p. 30.

By using forethought and more care, several of the common types of expanding and bulging operations can be successfully performed without using either fluid or soft rubber, and the operations are speeded up materially.

19-190. **Reverse Drawing of Stainless Steel at Lockheed Aircraft Corporation.** Jack L. McGraw and W. Glenn Schwartz. *Modern Industrial Press,* v. 6, June '44, pp. 38, 40, 42.

One of the many unique and modern forming methods is that used in reverse drawing ball and sleeve assemblies for the exhaust collectors on a new model bomber for the Navy. A repeated reverse draw from a circular blank of stainless steel is successfully accomplished to produce a complete assembly in one piece.

19-191. **Economy in Blanking.** Sergius D. Brootzkoos. *Modern Industrial Press,* v. 6, June '44, pp. 48, 50.

Relation between the number of round blanks to be cut, the number of rows to be selected and the length of the stock needed. This will determine the most economical size of the stock to be used.

19-192. **What's Ahead in Metal Stamping.** *American Machinist,* v. 88, July 6, '44, pp. 91-98.

How some of the advances in stamping will affect production.

19-193. **Methods for Forming Sheet Aluminum. III.** *Aviation,* v. 43, July '44, pp. 166-167, 264, 267.

Blanking and piercing detailed.

19-194. **Coating Compounds — Their Capabilities and Functions.** John H. Richards. *Wire & Wire Products,* v. 19, July '44, pp. 415-418, 454.

Resume of some typical performances of coating compounds in wire mill practice today, and a discussion of their functions, on both ferrous and alloy wires.

19-195. **Electric Equipment for Wire Drawing Machines.** A. L. Thurman. *Wire & Wire Products,* v. 19, July '44, pp. 420-424, 454.

Single block machine, multiple-block machine with single motor drive, group driven blocks, continuous machines, semi-continuous machines, multi-block continuous machines with individual block drives.

19-196. **Bethlehem Develops Special Tool for Making Dead Ends.** *Wire & Wire Products,* v. 19, July '44, pp. 430-431.

Primary winding element with developed prongs which so engage the wire that continuous tension is

induced as the wire is wound. Chromium plated contact surfaces minimize displacement of the zinc.

19-197. **Stepped Extrusions.** Kirby F. Thornton. *Mechanical Engineering,* v. 66, July '44, pp. 443-446.

Aircraft designs called for tapered spar caps; mechanical and other characteristics; accuracy of extrusion process; economics of multiple steps.

19-198. **Zinc Plating for Lubrication in Ironing and Drawing.** Harold A. Shepard. American Electroplaters' Society *Monthly Review,* v. 31, July '44, pp. 613-618.

Metal stock is formed and drawn into the semi-finished product. Final drawing operation is an ironing operation which irons the metal out to the desired wall thickness and length.

19-199. **Shapes Parts for Aircraft.** *Steel,* v. 115, July 10, '44, pp. 94, 128.

New speed and economy by Roto stretching method.

19-200. **Improved Presses for Aircraft Sheet Metal Forming.** Russell Powell. *Aero Digest,* v. 45, June 15, '44, pp. 86-87, 138.

Blankholder deep metal drawing press, hydraulic press equipped with rubber pad, "all-hydraulic" forging press.

19-201. **Plastic Punches Facilitate Lockheed Metal-Forming.** George H. Prudden. *Machinery,* 50, July '44, pp. 136-145.

Experience with punches made of thermoplastics and used in conjunction with Kirksite dies has proved that important advantages are attainable from this practice.

19-202. **Boeing Technique in Stretch - Forming Rolled and Extruded Shapes.** Boyd K. Bucey. *Machinery,* v. 50, July '44, pp. 146-155.

Principles followed in determining the proper path of cams and levers for controlling stretch-forming operations, and rules to observe in order to avoid distortion of sections.

19-203. **Rubber Sheeting Speeds Up Martin Stretching Operations.** Harry F. Vollmer. *Machinery,* v. 50, July '44, pp. 156-163.

How a simple idea saved production time on stretch-block work, eliminated hazards in handling stretched skin sections, promoted cleanliness, and reduced stretch-block costs. Stretching of extruded and rolled shapes.

19-204. **Hot-Forming Magnesium Plates at Northrop.** Paul Hawley and Robert L. Gunter. *Machinery,* v. 50, July '44, pp. 176-181.

Magnesium plates ¼ in. thick are successfully formed by a unique process which has decided advantages over more conventional methods.

19-205. **Consolidated Vultee Bucking-Bar Development Expedites Production Riveting.** E. P. Myers. *Machinery,* v. 50. July '44, pp. 188-191.

Savings in materials, reduced manpower requirements increased output, and improved workmanship are some of the advantages derived from radically different rivet-bucking devices of portable and built-in types.

19-206. **Friction.** L. D. Colam. *Iron & Steel,* v. 17, May 18, '44, pp. 391-396.

Particular needs of the rolling mill—brasses, anti-friction alloys, lubricants and lubricating systems. Data are given showing the increasing use of centralised systems in American steel plants, and examples of actual savings cited.

19-207. **Canadian Shell Forging Plant Uses Alloy Cast Iron Punch Tips.** *Industrial Heating,* v. 11, July '44, pp. 1084-1086.

A one-operation non-extrusion process for forging shells with interior cavities completely finished, requiring no final machining. Advantages claimed: (1) Substantial savings in material, (2) more rapid production to closer tolerances, (3) lower tool costs, (4) labor savings, and (5) fewer rejections.

19-208. **Recent Developments in Stretch Forming of Aircraft Parts.** Harry Wilkin Perry. *Modern Industrial Press,* v. 6, July '44, pp. 22, 23, 46, 48.

The process is analogous to hydraulic pressing, drawing and hammering in that it expands the metal to convex contours, but it is simpler and faster than hammering and drawing, as it accomplishes the result usually in a single operation. It is a relatively cheap method because of the low cost of form blocks compared with the cost of conventional dies and because of the large saving in forming time.

19-209. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, July '44, p. 28.

Saving time, costs and materials in building aircraft dies.

19-210. **Production Is Increased by Specially Designed Press Room Equipment.** Eugene E. James. *Modern Industrial Press,* v. 6, July '44, pp. 35, 36, 38, 40.

The floating pad, the adjustable block holder, the magnetic die set.

19-211. **A Set of Dies that Solved a Difficult Tooling Job.** Carl C. Taylor. *Modern Industrial Press,* v. 6, July '44, pp. 42, 44.

Problems encountered in producing irregular drawn parts of stainless steel.

19-212. **Heavy Presses at Chevrolet Produce Intricate Bomber Parts.** P. D. Aird. *Modern Industrial Press,* v. 6, July '44, pp. 11, 12, 14.

Several factors go into the final result, not the least of which is development in die design and, in the particular plant where wheel housings are being turned out, a press layout that permits a steady and uninterrupted flow of parts through the various processing stages.

19-213. **Expanded Oregon Steel Mill Produces Equipment for Maritime Commission.** *Western Metals,* v. 2, July '44, p. 29.

Hesse-Ersted takes over rolling mill for increased production.

19-214. **Modern Forging Practice.** W. A. DeRidder. *Western Metals,* v. 2, July '44, pp. 7-11.

Forging equipment; inspection; furnaces; die design and production; strength of carbon steels at elevated temperatures; production and die life using SAE 1020 as 100; minimum corner radii and fillets for forgings; draft; correct and incorrect method of dimensioning radii and fillets; additional design data; recommended minimum dimensions for "I" beam sections.

19-215. **Precision Thread Rolling with Flat and Cylindrical Dies.** *Machinery* (London), v. 64, June 1, '44, pp. 589-598.

High production, increased tensile strength, and superior surface.

19-216. **Sheet-Metal Shortcuts.** G. Eldridge Stedman. *Steel,* v. 115, July 31, '44, pp. 72-74, 76, 78.

Aircraft manufacturer's ingenious use of new forming methods and equipment.

19-217. **Draw-Press Work.** Eugene D. Viers. *Steel,* v. 115, July 31, '44, pp. 85-86, 115-116.

Correct lubrication proves key to successful operation.

19-218. **Forging Die Design.** John Mueller. *Steel Processing,* v. 30, July '44, pp. 425-426, 439.

Die design for forging ring and hub shapes.

19-219. **Stamping to Close Tolerances and the Use of Coining.** *Steel Processing,* v. 30, July '44, pp. 427-429, 435.

The close tolerances possible in stampings and the contribution of coining and sizing to the production of stampings of exact dimensions.

19-220. **Cold Roll Forming.** C. M. Yoder. *Iron & Steel Engineer,* v. 21, July '44, pp. 64-72.

Cold forming in continuous mills offers considerable economy over hot rolling methods for the production of many shapes.

19-221. **Continuous Drawing, Cutting-Off and Straightening Machine.** James Farmer. *Engineering,* v. 158, July 7, '44, pp. 7-8.

Wire is fed in from a coil and delivered as straight rods of predetermined length.

19-222. **Hot Forming of Magnesium Alloy Sheets.** E. P. Resos. *Iron Age,* v. 154, July 27, '44, pp. 43-48.

Weight saving factors are spur to explore the possibilities of magnesium alloys in aircraft structures. A summary of experimental investigations recently carried out at Vultee Field of basic interest to production and designing engineers.

19-223. **Impact Extrusion of Aluminum.** *Light Metal Age,* v. 2, July '44, pp. 9-11.

The impact extrusion process is particularly well adapted for the production of straight-sided, round and rectangular shells having a high ratio of length to cross-sectional area. The process permits the addition of necks and bosses at the closed end as an integral part of the extruded side wall.

19-224. **Modern Wire Drawing Practice.** *Metals & Alloys*, v. 20, July '44, pp. 73-77.

A pictorial trip through a new mill.

19-225. **Automatic Roll Forming.** G. W. Birdsall. *Steel*, v. 115, August 7, '44, pp. 86-90, 150, 152, 154.

Cuts production costs, speeds fabrication of fan and generator drive pulleys for jeeps, half-tracs, trucks, and other equipment. Ingenious use of roll forming with composite stampings, formed bar stock, malleable castings, etc. produces greatly diversified line of V-type pulleys. Assembly methods include riveting, projection and spot welding, silver brazing in electric induction units, copper brazing in controlled-atmosphere chainbelt furnaces.

19-226. **Precision Coining on the Punch Press.** *Tool Engineer*, v. 14, August '44, pp. 71-72.

Stamping industry developed techniques for cold-coining vital parts to close tolerances.

19-227. **Pneumatic Accumulator Aids Shell Forging.** C. H. Vivian. *Compressed Air Magazine*, v. 49, August '44, pp. 198-203.

System maintains constant water pressure at the forging presses and descaler. The accumulators store energy that can be drawn upon as needed.

19-228. **Tube Mills for Russia.** *Steel*, v. 115, August 14, '44, pp. 104, 160.

Convert coils of unpickled hot rolled steel strip into finished products of desired length, by continuous "straight-line" action.

19-229. **Sub-Sieve Diamond Powders for Die Work.** Paul L. Herz. *Wire & Wire Products*, v. 19, August '44, pp. 479-484, 516.

Producing accurately graded powders.

19-230. **Electric Equipment for Wire Drawing Machines.** A. L. Thurman. *Wire & Wire Products*, v. 19, August '44, pp. 488-492.

Tensiometers on wire drawing; applications; build-up reels; electric reel drives.

19-231. **The Manufacture of Specialty Diameter Wire.** *Wire & Wire Products*, v. 19, August '44, pp. 505-507.

Step-wire used to open, enlarge and polish the inside diameters of jewel bearings.

19-232. **Limits of Formability for Sheet Magnesium Parts.** P. A. Nagy. *Product Engineering*, v. 15, August '44, pp. 529-533.

Forming qualities of four magnesium alloys by the Guerin process and recommendations for the design of formed sheet magnesium parts are presented. Results of an investigation are summarized for flanges, joggles, beads and lightening holes. Tabular data include recommended bend radii, shearing stresses for holes and cupping depths for flanged holes. Relations between high forming temperatures and physical properties, and between sheet thickness and bend radii are shown graphically.

19-233. **The Design of Stampings for Quantity Production.** R. A. W. *Machinery* (London), v. 65, July 20, '44, pp. 65-71.

Tolerances and clearances, finishes applied to stampings, and drawings and specifications for stampings.

19-234. **Chevrolet-Detroit Forge Plant Served by Gigantic Power Plant.** *Industrial Heating,* v. 11, August '44, pp. 1236, 1238, 1240.

Production capacity.

19-235. **Bending and Forming Heavy Steel Sections Hydraulically.** C. W. Hinman. *Steel Processing,* v. 30, August '44, pp. 490-492.

Hydraulic arbor press operations; bending structural steel sections; description of die; using V-dies in hydraulic presses.

19-236. **Shell Forging. II.** M. D. Stone. *Steel Processing,* v. 30, August '44, pp. 493-497, 503.

Roller-type dies adopted; "upsetter" method of shell forging; forging shells by "one-shot" process; "nosing" operation; cold nosing.

19-237. **Heavy Stampings—Increasingly Incorporated in Equipment of all Kinds.** *Steel Processing,* v. 30, August '44, pp. 498-500.

Stampings no longer confined to small items of thin metals. Many plants in the pressed metal field are making provisions to handle heavy stampings.

19-238. **Light Alloy Extruded Sections.** W. Bleicher and G. W. Berger. *Luftwissen,* v. 10, no. 1, Jan. '43, pp. 23-27. *Engineers' Digest,* v. 1, August '44, pp. 499-501.

Extrusion billet, preheated to a suitable temperature, is pressed through an aperture in a die, whereby it obtains the required section shape. A great diversity of cross-sectional shapes is obtainable by this method.

19-239. **Safety Devices on Presses and Stamping Machines.** *Mecanique, Paris,* no. 315, July '43, pp. 235-236. *Engineers' Digest,* v. 1, August '44, pp. 512-513.

Devices to protect the fingers of the worker.

19-240. **A 388-Punch Press Tool.** *Machinery* (London), v. 64, June 29, '44, pp. 714-716.

Designed for punching catwalks for the flying fortress.

19-241. **The Rolling of Semi-Finished Steel.** Ross E. Beynon. *Iron & Steel Engineer,* v. 21, August '44, pp. 37-54.

Methods and problems in rolling semi-finished steel. Work still to be done in improving product and reducing costs.

19-242. **Many Deep Drawing Problems Solved Successfully in Setting Up Steel Cartridge and Shell Case Program.** Harold R. Turner. *Steel,* v. 115, Sept. 4, '44, pp. 82-83, 114, 116, 118, 120, 122, 126, 128, 130, 132, 134.

Report on the problems involved and the manufacturing methods employed in producing steel cartridge and shell cases for the Army. Navy is continuing its program and heat treated carbon steel cases for 40-mm. shells are being produced monthly by the millions.

19-243. The Extrusion of a Brass Cup. G. Sachs, J. Ogden, and F. J. Miller. *Modern Industrial Press,* v. 6, August-Sept. '44, p. 24.

Laws of plastic working make it possible to fabricate complicated parts by press forming frequently more economically than by machining, casting, welding, or brazing.

19-244. Recent Developments in Stretch Forming of Aircraft Parts. II. Harry Wilkin Perry. *Modern Industrial Press,* v. 6, August-Sept. '44, pp. 26, 28, 56.

Equipment consists of a 300-ton Erco skin-stretch press, a Sheridan skin-stretch press, a Hufford extrusion-stretching machine, an 800-ton double-acting press, and a number of miscellaneous stretching fixtures.

19-245. Cold-Drawn Steel Cartridge Cases at Norris Stamping & Manufacturing Co. II. *Modern Industrial Press,* v. 6, August-Sept. '44, pp. 35-38.

Cold-drawn steel casing fired without malfunctioning.

19-246. Combination Forming and Shearing Dies for Master Rubber Pad. Gordon B. Ashmead. *Modern Industrial Press,* v. 6, August-Sept. '44, pp. 41-42, 44, 46.

Aircraft design revolutionized with the help of the Guerin process.

19-247. Forging Naval Shells by the Pierce and Draw Method. *Iron Age,* v. 154, Sept. 7, '44, p. 67.

Production advantages resulting from the adaptation of the pierce and draw method of forging large caliber projectiles for the U. S. Navy.

19-248. A Survey of Wrought Magnesium Alloy Fabrication. J. V. Winkler. American Society for Metals. 1944 Preprint No. 8, 55 pp.

Latest developments for the fabrication of wrought magnesium alloys. A detailed discussion of methods employed in a fabricating shop for shaping magnesium alloy parts, and methods of joining component parts in fabricating a magnesium alloy structure.

19-249. Aluminum Alloy Forging Materials and Design. L. W. Davis. American Society for Metals 1944 Preprint No. 21, 25 pp.

Alloys available for forgings are enumerated and the advantages of each are indicated. A method of determining relative forgeability described. The method permits evaluation of new forging materials and accurate comparison with other alloys. New forging equipment has been developed especially to handle aluminum alloys. A description of a hydraulic forging press, a forging roll and other equipment given.

19-250. A Variable Reciprocating Motion. L. K. *Machinery* (London), v. 65, July 13, '44, pp. 41-42.

Reciprocating mechanism used on a wire-fabricating machine to convert a uniform motion into a variable motion.

19-251. Design of Dies for Producing Printing-Press Gripper Pads. H. E. M. *Machinery* (London), v. 65, August 3, '44, pp. 131-132.

The blanking, piercing, and forming operations required to produce this piece could be performed most efficiently and economically by employing two dies of the simple design illustrated.

19-252. **Special Systems of Regulation for Continuous Mills in Steel Works.** *Brown Boveri Review,* v. 30, Nov.-Dec. '43, pp. 324-327.

Various methods of operation of rolling mills; gives details of the system of regulation best suited to each individual case.

19-253. **Spar Flanges and other Extrusions in Various Enemy Aircraft.** *Metallurgia,* v. 30, July '44, pp. 163-164.

Data obtained as a result of a metallurgical examination of spar flanges and other extruded sections taken from enemy aircraft summarized.

19-254. **Heel Nails and Wire Screen.** A. G. Arend. *Machinery* (London), v. 65, August 3, '44, pp. 128-130.

Simultaneous production from the same strip.

19-255. **Tubes with Reduced Ends for Light Tubular Structures.** Arthur Z. Bendar. *Product Engineering,* v. 15, Sept. '44, pp. 635-637.

Improved methods of reducing the diameter of round tube ends permit more efficient applications of tubing to structural subassemblies. Proper design illustrated and common reducing and swaging methods for this operation compared.

19-256. **Flange Rolling Improves Quality, Speeds Output.** *Aviation,* v. 43, Sept. '44, pp. 146-147, 249.

A flange rolling machine, using backing and forming rolls and heating unit for making flanged bushings.

19-257. **Designing Rubber Press Tools.** J. Albin. *Iron Age,* v. 154, Sept. 14, '44, pp. 50-57.

Accurate forming of sheet metal in the hydropress accomplished if consideration is given to the dual action of the frictional and fluid properties of the rubber when under compression. Based on this analysis of rubber pad action, design standards established together with the development of unusual form blocks and other rubber press tools. Elimination of hand finishing is illustrated by novel uses of dams, undercuts, punches and other tool elements.

19-258. **Coining Heavy Gage Stampings.** Stanley H. Brams. *Iron Age,* v. 154, Sept. 14, '44, pp. 58-60.

Coining of heavy gage stampings is related to cold forging or upsetting. The term implies accurate sizing and work hardening of the material to higher strengths. Some of the possibilities of the process are found in examples taken from practice at the Detroit Stamping Co.

19-259. **What's Ahead in Forging.** *American Machinist,* v. 88, Sept. 14, '44, pp. 91-96.

Forging practice improved in meeting war production demands. The modernization of equipment and enlarged forging capacity will be a big factor in spreading the use of forging to new fields.

19-260. **Seamless Tubes and Spinning Process Result in Superior Bomb Casings.** *American Machinist,* v. 88, Sept. 14, '44, pp. 115-120.

Design and installation.

19-261. **History and Growth of the Tungsten Carbide Die.** A. R. Zapp. *Wire & Wire Products,* v. 19, Sept. '44, pp. 543-546, 569-570, 571.

Development and perfecting of dies. Three classes of industries; sintered-carbide dies; use in America; older types of dies; evolution of basic die shape; die machinery developed; rough-cored dies; reasons for carbide adoption; growth is mutual.

19-262. **Sub-Sieve Diamond Powders for Die Work. II.** Paul L. Herz. *Wire & Wire Products,* v. 19, Sept. '44, pp. 547-549, 572-574.

Helpful formulae; selection of a liquid; difficulties and how to overcome them. Practical hints.

19-263. **Small Diamond Die Industry Advisory Committee Meeting Brings Out Interesting Facts on Die Situation.** *Wire & Wire Products,* v. 19, Sept. '44, pp. 550-553, 579.

Requirements of dies; supply of dies; increased productivity of dies; technical mission to England; general organization; manufacturing methods; efficiencies of die manufacturers; developments on methods in progress; form and quality of dies; die specifications drawn up; wire drawing; die performance; comments on Dr. Whittaker's report; labor and selective service efficiency rating method; other labor problems; wages; rough diamonds.

19-264. **Ten Recommendations for the Use of Diamond Drawing Dies.** *Wire & Wire Products,* v. 19, Sept. '44, pp. 554, 580-582.

Annealing and pre-treatment; die holder and its treatment; introduction of wire; lubrication and cooling; when to withdraw; spare dies; drawing speed; weight of stone; diamond and sintered carbide dies; handling diamond dies. 3 ref.

19-265. **Designing Rubber Press Tools.** *Iron Age,* v. 154, Sept. 21, '44, pp. 59-66.

Applications of rubber press tools for forming concave, convex and reverse flanges, joggles and some more difficult shapes are described. Certain drawing operations on sheet aluminum hitherto considered beyond the capacity of the hydropress also described.

19-266. **Reynolds Aluminum Fabrication.** Joseph Geschelin. *Automotive Industries,* v. 91, Sept. 15, '44, pp. 38-40, 82, 84, 86.

Service organized on large scale basis and will be offered to postwar trade.

19-267. **The Use of Rubber in Conjunction with Press Tools.** *Machinery,* v. 51, Sept. '44, pp. 172-176.

Effective and economical methods of producing a wide range of sheet-metal parts.

19-268. **Mill Design.** A. E. Lendl. *Iron & Steel,* v. 17, August '44, pp. 560-563.

Need for research to avoid costly "trial and error" methods. Pressure calculation; influence of temperature

and roll diameter; influence of initial width and degree of reduction; prevented spread.

19-269. **The Drawing of Wire from High Speed Steel R.F.I.** V. Nagorny. *Novosti Tekhniki,* v. 9, no. 11-12, '40, pp. 24-25; *Chem. Zentr.* I, '41, pp. 2852-2853. *Alloy Metals Review,* v. 3, March '44.

The waste in the manufacture of cutting tools only 1.5 to 5 mm. in diameter from 6 to 6.5 mm. steel ingots can be reduced from 90 to 10% by cold drawing the ingot. The ingots were heated to 875° over a period of 9 hr., held at this temperature for 6 hr., cooled to 675° over a period of 4 hr., heated to 700° in 1 hr., held at this temperature for 5 hr., and cooled to room temperature in another 5 hr. R.F.I. high speed steel containing C 0.72 to 0.79, Mn 0.39 to 0.4, Si 0.38 to 0.4, Cr 3.9 to 4.3, Ni 0.2, W 17.9 to 18.4, V 1.2 to 1.3, P 0.029 to 0.03 and S 0.028 to 0.029% when so treated showed a tensile strength of 106.5 to 108 kg/sq. mm. and extension of 11.5 to 12.4% and a Brinell hardness of 95 to 98. The ingot was then pickled for 40 min. in 8 to 12% H_2SO_{84} at 45 to 80°, dried 20 min. at 90 to 100° and drawn at a rate of 12 per min. Powdered graphite with or without 30% talc was found to be the most satisfactory lubricant for this process. After every second drawing process the metal was heated to 680 to 690° for 75 min. in a bath containing NaCl 40, KCl 40, and Na_2CO_3 20% or NaCl 50, K_2CO_3 25 and Na_2CO_3 25%, then cooled in air, plunged into water at 90 to 100° and again pickled as above for 10 min. After drawing, the wire showed a tensile strength of 100 to 105 kg./sq. mm., an extension of 3 to 6.5% and a hardness of 27 to 28. After annealing, the corresponding values were 77 to 80 kg./sq. mm., 10.4 to 11.7% and 17 to 18.5 units. Steel wire pickled in bundles showed a surface corrosion.

19-270. **Krause Reciprocating Mill Used in Brass Rolling.** *Iron Age,* v. 154, Sept. 28, '44, pp. 60-63.

Unique rolling mill with a reciprocating roll assembly is being successfully employed for heavy reductions on wide brass strip. Indications are that it also may find application in the reduction of steel strip requiring particular physical characteristics.

19-271. **Induction Heating for Forging Shells.** *Metals & Alloys,* v. 20, Sept. '44, pp. 631-635.

Plant visit in pictures.

19-272. **Stretch-Pressing.** *Aircraft Production,* v. 6, Sept. '44, pp. 447-451.

Notes on developments in the United States.

19-273. **The Selection of Steels Used in the Rolled or Drawn Condition, I.** John H. Frye. *Metal Progress,* v. 46, Oct. '44, pp. 705-712.

Factors that underlie the intelligent selection of any steel for a given duty, emphasizing that it also requires the cooperation of designer, production man, metallurgist, and purchasing agent.

19-274. **Common Sense Approach to Forming Problems.** *Tool Engineer,* v. 14, Oct. '44, pp. 79-84.

Experience of progressive Eastern stamping company associated with automotive industry indicates that the

modern approach to fabricating problems will include broader consideration of forming methods.

19-275. **Effect of Shape on the Formability of Deep-Drawn Sheet-Metal Parts.** W. A. Box and Wm. Schroeder. *Mechanical Engineering,* v. 66, Oct. '44, pp. 643-648, 662.

Experimentally determined results of the effect of size and shape on the limits for single-operation deep-drawn parts. The important elements that must be considered in determining the drawing limits are the over-all dimensions of the base of the part; the size of corner radii; the shape of the part; and the thickness of the material. Punch nose radii and draw radii must also be considered in order to obtain optimum results in deep drawing.

19-276. **High Speed Steel Forgings for Cutting Tools.** W. H. Wills. *Steel Processing,* v. 30, Oct. '44, pp. 656-657, 659.

Production and uses.

19-277. **Stampers to Make End-Products and Subassemblies.** *Steel Processing,* v. 30, Oct. '44, pp. 658-659.

In taking their place in post-war volume production, many job stampers will be prepared to offer their customers and prospective customers more than the production of a stamping made to the customer's specification. Operations such as assembling, brazing, welding, finishing, painting, plating and even porcelain enameling will be offered along with press work.

19-278. **Blanking and Forming Aircraft Parts at Boeing's Wichita Plant.** C. W. Hinman. *Steel Processing,* v. 30, Oct. '44, pp. 660-661, 678-680.

Boeing's in Wichita, Kansas, have developed some of the most interesting and useful time saving mass production methods used in the war.

19-279. **Aircraft Control Joints Reinforced by Swaging.** Thomas A. Dickinson. *American Machinist,* v. 88, Oct. 12, '44, p. 105.

A new method of swaging push-rod tubing around end fittings or terminals enables the finished rod to handle comparatively heavy axial or torsional loads. This method makes it possible to indent, or swage, the tubing around a square, hexagon, knurled or otherwise roughened plug and greatly increases the strength of the engine and flying controls of large modern aircraft.

19-280. **Some Problems Influencing the Drawing of Fine Wire.** H. P. Edinga. *Wire & Wire Products,* v. 19, Oct. '44, pp. 650-653, 739.

Products and applications; difficulties encountered; die problem.

19-281. **Tension and Velocity Controls; Applications of the Mechanical Variable Speed Transmission.** Joseph H. Gepfert. *Wire & Wire Products,* v. 19, Oct. '44, pp. 682-685, 688-691, 729.

Velocity and tension controls have become an extremely important part of daily life in the wire mill. These along with automatic controls are the basis of continuous production systems.

19-282. **Designing of "Trouble-Free" Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, Oct. '44, pp. 18, 20.
Die for making 80 plier handles per min.

19-283. **Forming and Parting Dies.** James Walker. *Modern Industrial Press,* v. 6, Oct. '44, pp. 38, 40, 42.
Construction, features.

19-284. **Combination Tool for Blanking and Drawing a Beaded Cup.** E. Barron. *Machinery* (London), v. 65, Sept. 21, '44, pp. 324-325.
A method of producing the pressed-metal cup by means of a combination tool.

19-285. **Recent Advances in Making Aluminum-Alloy Forgings.** L. W. Davis. *Machinery,* v. 51, Oct. '44, pp. 145-150.
Procedure in making the dies, selecting the alloy, and performing the forging and heat treating operations required to produce aluminum forgings of specified characteristics.

19-286. **The Use of Rubber in Conjunction With Press Tools.** *Machinery,* v. 51, Oct. '44, pp. 179-181.
Effective and economical methods of producing a wide range of sheet-metal parts—second of three articles.

19-287. **Head-Wrightson Light-Alloy Straightening Machines.** *Machinery* (London), v. 65, Sept. 7, '44, pp. 271-275.
On account of the wide diversity of aluminum-alloy sections now being called for, it is practically impossible to design roller-type equipment for the straightening operations, and stretching machines are now employed for this purpose.

19-288. **The "Extrusion Effect" in Aluminum Alloys.** H. K. Hardy. *Metallurgia,* v. 30, Sept. '44, pp. 240-244.
Highest tensile values of certain aluminum alloys are obtained in the longitudinal direction of extruded material. 20 ref.

19-289. **Spar-Milling Operations in the Production of the Lancaster.** *Machinery* (London), v. 65, Sept. 28, '44, pp. 337-344.
Methods employed at a Vickers-Armstrong factory.

19-290. **Draw Presses Simplify Metal Working Jobs.** Merton J. Stevens. *American Machinist,* v. 88, Oct. 26, '44, pp. 119-120.
Method eliminates drop hammers for processing aluminum parts. Changeover effected savings in the costs of dies and set-ups.

19-291. **One-Shot Forging.** Arthur F. Macconochie. *Steel,* v. 115, Oct. 30, '44, pp. 74-77, 126.
Production of 155-millimeter shell produces thin-walled shapes with single stroke of press and provides solution of problems such as metal flow, stroke, punches and dies and lubrication.

19-292. **The Automatic Preset Screw-down.** R. E. Marrs. *Blast Furnace & Steel Plant,* v. 32, Oct. '44, pp. 1191-1197.
The fundamental idea; advantages of variable voltage amplidyne control incorporated; the Selsyn system; the electronic panel; the roll opening selector; the limit

switch Selsyn unit; the pass transfer relay; the roll diameter selector; the mill Selsyn tachometer unit; the pass selector unit; the elementary diagram; what does the operator do?; typical operation.

19-293. **New Type of Cold Reducing Mill Placed in Operation.** *Blast Furnace & Steel Plant,* v. 32, Oct. '44, pp. 1220-1224.

Instead of the material passing through power driven rolls, the material is held in tension by a gripper and the rolls are moved by frictional contact between cam plates and the metal between the rolls approximating "turks head" rolling. The rolls are not driven by the direct application of power through spindles. Their motion and pressure are produced by the action of reciprocating cam plates.

19-294. **Flexural Strength in the Plastic Range of Rectangular Magnesium Extrusions.** F. A. Rappleyea and E. J. Eastman. *Journal of Aeronautical Sciences,* v. 11, Oct. '44, pp. 373-377.

Problem exists in the use of magnesium alloys in aircraft of determining the resisting moment in bending. Mathematical formula developed. 8 ref.

19-295. **Bending Preformed and Extruded Sheet-Metal Sections.** Thomas T. Tobin. *Machinery* (London), v. 65, Oct. 5, '44, pp. 365-371.

Use of wrap-forming and cam-type bending machines on aircraft structural members.

19-296. **Effects of Heating and Rolling on Blooms, Billets and Bars.** Robert Sergeson. *Iron & Steel Engineer,* v. 21, Oct. '44, pp. 35-41.

Discusses many of the factors which play an important part in the quality and structure of semifinished steel.

19-297. **Effects of Heating and Rolling in the Strip Mill.** W. H. Richey. *Iron & Steel Engineer,* v. 21, Oct. '44, pp. 42-44.

With the many variables involved, strict control is essential to maintain high quality in flat-rolled products. Close cooperation is required between operating and metallurgical departments.

19-298. **The Mills.** Charles Moon. *Iron & Steel Engineer,* v. 21, Oct. '44, pp. 59-60.

Description of Great Lakes Steel Corp. mills.

19-299. **Roll Designing.** Thomas Smith. *Iron & Steel Engineer,* v. 21, Oct. '44, pp. 61-65.

Main steps to be taken.

19-300. **Forging Magnesium.** G. Ansel. *Light Metal Age,* v. 2, Oct. '44, pp. 14-17.

Properties, forging equipment, die design and actual forging practice.

19-301. **A Simple Hydro-Press Formability Test for Sheet Metal.** George C. Barber. *Automotive Industries,* v. 91, Oct. 15, '44, pp. 26-29, 86.

Information about the extent to which metal sheets may be bent, stretched or compressed under the rubber pad of the hydropress.

19-302. Methods for Computing Springback When Bending Stainless Steel. C. M. Brown, W. O. Binder and Russell Franks. *Metal Progress,* v. 46, Nov. '44, pp. 1077-1081-D.

Elastic theory of sheet metal bending and forming has been worked out by engineers in the aircraft industry, and tables, graphs and alignment charts for solving problems in die design for 18-8 and 17-7 steel sheet, both in annealed condition and cold rolled to various high yield strengths.

19-303. The Design for Production of Sheet Metal Aircraft Parts. Frank M. Mallett. *SAE Journal,* v. 52, Nov. '44, pp. 526-533.

Determination of working limits of elongation and compression in different types of sheet metal forming, and the application of these limits to the design for formability. 16 ref.

19-304. An Appraisal of Precision Thread Rolling Practice. Frank J. Oliver. *Iron Age,* v. 154, Nov. 9, '44, pp. 69-74.

Die design factors and performance characteristics of the several grades of tool steel employed for flat dies.

19-305. The Use of Rubber in Conjunction with Press Tools. *Machinery,* v. 51, Nov. '44, pp. 161-165.

Effective and economical methods of producing a wide range of sheet-metal parts.

19-306. Hard-Faced Punches and Dies Used to Blank Tungsten Sheet. Howard W. Philip. *American Machinist,* v. 88, Nov. 9, '44, pp. 105-106.

Tools hardened with Tantung 53 satisfactory for meeting high temperatures necessary for the blanking operations on tungsten.

19-307. Designing Tools for Forging. George Espey and Pat Culhane. *Steel,* v. 115, Nov. 13, '44, pp. 108-111, 148, 151-152, 154, 156, 158, 160, 162, 164, 166, 168.

Principles behind correct tool design as applied to pierce-bottom-and-draw and other methods of forging shell. 16 ref.

19-308. The Ford "Greenhouse Job" Requires Many Unique Press Operations. P. D. Aird. *Modern Industrial Press,* v. 6, Nov. '44, pp. 15-18.

The press-work operation which transforms a shimmering sheet of aluminum into the framework of the pilot's enclosure in one of the Army's heaviest bombers. Difficult structural angles, deep channeled draws, close manufacturing tolerances, a complicated preforming operation and a series of trim and piercing operations.

19-309. The Drop-Hammer at Douglas. E. E. Hanson. *Modern Industrial Press,* v. 6, Nov. '44, pp. 22, 24.

Drop-hammer is a cold process in aircraft. Production drop-hammer work starts with the dies and continues in all stages between and up to the final inspection before fabrication.

19-310. Designing of "Trouble-Free" Dies, XXXII. C. W. Hinman. *Modern Industrial Press,* v. 6, Nov. '44, p. 26.

"Blank thickness separator" is a simple but highly efficient device for producing certain types of drawn shells.

19-311. **Contour Forming with Linkage Action Stretch Dies.** Roy W. Osborn. *Modern Industrial Press,* v. 6, Nov. '44, pp. 31-32.
Forming of deeply contoured sections with "toggle" acting dies.

19-312. **Methodical Die Planning for Maximum Production at Lockheed Aircraft Corporation.** Jack L. McGraw and W. Glenn Swartz. *Modern Industrial Press,* v. 6, Nov. '44, pp. 34, 36, 38.
The clamp; finish form clamp die; operation; the socket; second operation socket die (reverse draw); third operation form die (reduction draw).

19-313. **Low Priced Blank and Pierce Dies, I.** James Walker. *Modern Industrial Press,* v. 6, Nov. '44, pp. 40, 42.
The discovery of many new methods.

19-314. **Stretch-Forming Extruded Shapes.** B. K. B. *Machinery* (London), v. 65, Oct. 19, '44, pp. 429-435.
Producing uniform and irregular curves in rolled or extruded shapes of aluminum alloy by bending the material over a form of the required shape and elongating the material until it is stressed to a point somewhere between the yield point and the ultimate strength.

19-315. **Pneumatic Accumulator Aids Forging of Shells.** C. H. Vivian. *Industrial Gas,* v. 23, Nov. '44, pp. 12-14, 29-30.
Forging projectiles for 75-mm. and 105-mm. shells from steel blanks and machining them.

19-316. **Zinc-base Alloy Dies Prove Economical for Producing Short Runs of Stampings.** *Steel,* v. 115, Nov. 20, '44, pp. 114, 158, 160.
Outlines the use of Kirksite for flexible sheet metal dies and tools.

19-317. **Deep Drawing Oil Sump Pans.** G. W. Birdsall. *Steel,* v. 115, Nov. 27, '44, pp. 74-77, 110, 112.
Improved die designs and drawing lubricants permit making 5½-in. deep draw in a single operation instead of two. Stamping plant adds resistance and arc welding, lead dip bath and lead burning facilities to completely finish parts.

19-318. **Forming and Parting Dies.** James Walker and Carl Taylor. *Steel,* v. 115, Nov. 27, '44, p. 88.
Special tools permit production in multiples; minimize distortion; simplify operations.

19-319. **Deep Drawing and Forming of Magnesium Sheet.** Arthur E. Meyer. *Iron Age,* v. 154, Nov. 30, '44, pp. 44-50.
Methods for accomplishing deep draws in a single operation, particularly the critically controlled heating of the magnesium sheet and the dies.

19-320. **Electric Drive Control.** *Iron & Steel,* v. 17, Nov. '44, pp. 682-683.
Applications of the "Metadyne" in steelworks.

19-321. **The Cold-Rolling of High-Tensile Strip Steels and Their Properties.** A. Pomp and W. Puzicha. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* v. 26, no. 2, '43, pp. 13-36. Abstract Iron and Steel Institution *Bulletin,* no. 106, Oct. '44, p. 150-A.

A report is presented on the effect of rolling at temperatures from -183° C. to +200° C. on the properties of steel strip.

19-322. **Bending and Forming Strip Metal.** R. Harries. *Machinery* (London), v. 64, Nov. 9, '44, pp. 520-521.

Simple method for small quantities.

19-323. **Heating and Rolling in the Bar Mill.** J. L. McHugh. *Iron & Steel Engineer,* v. 21, Nov. '44, pp. 44-47.

No set prescription may be made for heating and rolling steel, particularly in the bar mill, where so many items contribute to the success or failure of the operation. Each mill must be subjected to individual study and must be constantly improved.

19-324. **Main Roll Drives for Merchant-Bar and Rod Mills.** W. B. Snyder. *Iron & Steel Engineer,* v. 21, Nov. '44, pp. 48-58.

Many variables affect the power requirements of merchant mills, requiring much test data collected over a wide range of conditions. There is need for additional test work and for the collection of such data into usable form. 10 ref.

19-325. **Cast Steel Roll Manufacture and Application.** F. H. Allison. *Iron & Steel Engineer,* v. 21, Nov. '44, pp. 59-62, 64-65.

No two mills are exactly alike in design, product, reductions and operator. Hence, roll application is not an exact science, but can be improved only by cooperation of the user and the manufacturer. A knowledge of roll manufacturing methods will enable the user to obtain greater service and economy.

19-326. **Rolling Alloy Steels at Atlas Steels, Limited.** C. P. Hammond and A. M. Cameron. *Iron & Steel Engineer,* v. 21, Nov. '44, pp. 66-73.

Cognizant of the fact that they cannot completely cover the field, the authors present an outline of some of the factors in the selection of a rolling unit to produce high alloy and special steels efficiently. Their viewpoint differs from that of the large producer of a limited number of grades.

19-327. **Alignment Charts for Bending Dies for 18-8 & 17-7.** C. M. Brown, W. O. Binder and Russell Franks. *Metal Progress,* v. 46, Dec. '44, pp. 1268-1272.

The use of alignment charts to solve bending and forming problems.

19-328. **Combining Stretch and Pressure Contour Forming.** *Iron Age,* v. 154, Dec. 7, '44, pp. 75-77.

Contour forming machine combining the operations of stretch forming and compression forming. Using dies of various shapes and sizes, this machine makes difficult contours out of sheets and plates as well as

shapes and extrusions. Built with a pivoted hydraulic cylinder working in conjunction with it.

19-329. **Gap Mill Forging.** G. W. Birdsall. *Steel,* v. 115, Dec. 11, '44, pp. 116-119, 166, 168, 170, 172.

Eliminates metal wasted in forging flash; allows use of smaller forging blanks; improves fiber arrangement and thus raises quality of the forging; eliminates eight machining operations on typical forgings; makes important reductions in finishing costs. Wartime applications of process point way to greatly increased forging efficiencies in postwar era.

19-330. **New Unitemper Mill and Process.** M. D. Stone. *Steel,* v. 15, Dec. 11, '44, pp. 132-134.

New type mill operates on principle of continuous stretching and imparts necessary temper hardness to tin plate combined with satisfactory ductility and flatness for fabrication. Two independent 2-high mills mounted in same housings are provided with separate roll adjustment. Mills driven by separate motors. Average delivery speed is 2500 ft. per min. though operating limit is higher. Unit also suitable for production of high-finished sheets and strip mill items.

19-331. **Drawing Tubelike Tanks from Aluminum Disks.** Gordon B. Ashmead. *Machinery,* v. 51, Dec. '44, pp. 156-161.

Aluminum cartridge tank manufactured by the methods described has four main metal components—the body, top ring, insert, and cover ring.

19-332. **Deep Drawing Steel.** G. Eldridge Stedman. *Steel,* v. 115, no. 25, Dec. 18, '44, pp. 90, 91, 132, 134, 136, 139, 140.

Improved forming, heat treating, lubricating and other methods worked out by Norris Stamping & Mfg. Co. in producing steel cartridge cases are expected to prove useful when production is converted to peacetime products.

19-333. **Stretch Forming.** *Steel,* v. 115, Dec. 4, '44, pp. 126, 129.

Odd-shaped sections of aluminum alloy.

19-334. **Drop Forging.** *Automobile Engineer,* v. 34, Nov. '44, pp. 483-490.

Die design and the methods employed in the die sinking and forge departments described. Details given of the way that scientific control is exercised throughout all stages of production by systematized chemical, metallurgical and dimensional examination.

19-335. **Rubber Sheeting Speeds Up Metal Stretching Operations.** *Machinery* (London), v. 65, Nov. 16, '44, pp. 539-545.

Substitution of sheeting brought about revolutionary changes in the production procedure of the stretching department, eliminating all the disadvantages of grease and the incidental operations required for grease removal; procedure outlined.

19-336. **Cold Working and Forming of Silicon-Manganese Spring Steel.** R. G. Sartorius. *Iron Age,* v. 154, Dec. 14, '44, pp. 50-51.

The full annealing without graphitization of silicon-manganese spring steels has resulted in definite advantages in the cold working and forming of this grade of steel.

19-337. **Deep Drawing Steel.** G. Eldridge Stedman. *Steel*, v. 115, Dec. 18, '44, pp. 90, 132, 134, 136, 139-140.

Improved forming, heat treating, lubricating and other methods worked out by Norris Stamping and Manufacturing Co. in producing steel cartridge cases are expected to prove useful when production is converted to peacetime products.

19-338. **Theory of Wire Drawing.** E. A. Davis and S. J. Dokos. *Journal of Applied Mechanics*, v. 11, Dec. '44, pp. A-193-A-198.

Theory in which the force required to produce plastic deformation of a wire passing through a die may be determined; strain hardening of the wire being drawn is considered. 11 ref.

19-339. **Unitemper Mill and Process.** M. D. Stone. *Blast Furnace and Steel Plant*, v. 32, Dec. '44, pp. 1457-1459.

Temper roll in coil form; gradually the old style 2-high plain bearing temper pass mills have been replaced by modern 4-high mills.

19-340. **Difficult Parts Formed Easily with Die-Less Press Tools.** C. W. Hinman. *American Machinist*, v. 88, Dec. 21, '44, pp. 108-110.

Novel methods employed in preparing, reinforcing and setting up sheet-metal and other parts for shearing, notching or piercing without the use of dies.

19-341. **Fabrication With Wide Plates.** W. G. Theisinger. *Steel*, v. 115, Dec. 25, '44, pp. 76-78, 80, 109.

Reduces costs in making boilers, tanks and pressure vessels.

19-342. **Roll Forging and Twisting Process.** *Steel*, v. 115, Dec. 25, '44, pp. 82, 84, 86, 119.

Developed for production of shankless twist drills.

19-343. **Concerning the Mechanical Technology of Shaping Methods.** E. Siebel. *Metall-Wirtschaft*, v. 22, nos. 30-32, Sept. 20, '43, pp. 423-428.

Factors involved in the shaping of metallic materials are mathematically and graphically interpreted. Different methods of shaping, e. g., rolling, pressing, and drawing, analyzed.

19-344. **Concerning the Determination of Energy Required and the State of Stress in Wire Drawing.** Th. Poschl. *Metall-Wirtschaft*, v. 22, nos. 30-32, Sept. 20, '43, pp. 428-434.

Different steps in the process of wire drawing mathematically analyzed. Their relations are established by means of equations; the corresponding coefficients determined. This makes possible easy calculation of energy required and the state of stresses prevailing during the entire process.

19-345. **Deformation During Die Forging and the Dependence of the Strength Properties on the Position of the**

Blank in the Dies. H. Unckel. *Metall-Wirtschaft,* v. 22. nos. 30-32, Sept. 20, '43, pp. 437-443.

The analysis of the stresses occurring in metal blocks, differently placed (according to their original directional axis) during die forging, explains the differences in the properties of the forgings produced from such blocks.

19-346. **A New Method of Heating of the Holding Chamber in a Metal Extrusion Press.** F. Husarek. *Metall-Wirtschaft,* v. 22, nos. 30-32, Sept. 20, '43, pp. 443-447.

Different types of extrusion presses, together with several methods of heating holding chambers, are comparatively analyzed. Description of a holding chamber newly designed and electrically heated is presented; the advantages of such installation emphasized.

19-347. **Plastic Dies for Forming Light Metals.** W. Krause. *Metall-Wirtschaft,* v. 22, nos. 30-32, Sept. 20, '43, pp. 447-449.

Dies for use in pressing aluminum aircraft parts with pressure applied through a rubber blanket are made from a special phenol-formaldehyde plastic.

SECTION XX

MACHINING AND MACHINE TOOLS

20-1. **Calibrated Handwheel for Turret Lathes.** *Iron Age,* v. 153, no. 3, Jan. 20, '44, p. 69.

Handwheel for turret lathe cross-slide longitudinal travel, used with or without the regular machine stops, has been devised at the Pittsfield works of the general Electric Co. to enable even inexperienced operators to obtain closer and more uniform dimensions than can be obtained with stops alone.

20-2. **Hydraulic Fixture Aids Broaching Operation.** *Iron Age,* v. 153, no. 3, Jan. 20, '44, p. 67.

Deep slots are being successfully broached to close tolerances on small parts with the aid of a special hydraulically actuated clamping fixture.

20-3. **Dynamite as a Machine Shop Tool.** Seward A. Covert. *Modern Machine Shop,* v. 16, no. 8, Jan. '44, pp. 194-200, 205-208.

Simple, effective means of removing broken drills from crankshafts with explanation of technique.

20-4. **Tooling for Boring and Facing Torpedo Ends.** *Machinery* (London), v. 63, no. 1624, Nov. 25, '43, pp. 595-597.

Description of a special tooling unit applied to the 4-F platen type Foster Fastermatic for boring and facing torpedo ends.

20-5. **Broaching Oblique Holes.** W. Cooper. *Machinery* (London), v. 63, no. 1626, Dec. 9, '43, pp. 653-655.

Production difficulties, tensile safety factor, teeth, squaring the circular bore.

20-6. **Fine Boring Practice.** W. Boneham. *Machinery* (London), v. 63, no. 1627, Dec. 16, '43, pp. 673-679.

The principle of fine boring is a high spindle speed, a very fine feed and a light cut. Due to exceptionally low machining stresses, very light clamping arrangements can be made, avoiding distortion of the component. Versatility of fine boring, spindle accuracy, diameter variation by quill adjustment, diamond, feed and surface speed also treated.

20-7. **The Relief of Formed Cutters.** J. G. Smith. *Machinery* (London), v. 63, no. 1624, Nov. 25, '43, pp. 599-602.

Study of the technique of applying relief to the teeth of rotary-type cutting tools. Description of methods of

determining the form of the relieving curve and processes of relieving various forms of cutters.

20-8. **Eccentric Gear Mechanisms for Variable Angular Velocity.** P. G. *Machinery* (London), v. 63, no. 1624, Nov. 25, '43, pp. 603-604.

Practical application of eccentric gear mechanisms for variable angular velocity.

20-9. **Unusual Grinding Applications on Small Parts.** *Machinery,* v. 50, no. 5, Jan. '44, pp. 165-166.

Method for grinding two eight-sided cams from two different diameter rounds.

20-10. **Securing Fine Surface Quality.** H. J. Wills. *Machinery* (London), v. 63, no. 1621, Nov. 4, '43, pp. 513-515.

Grinding machines, reconditioning spindles, factors affecting grinding.

20-11. **Securing Fine Surface Quality by Grinding.** H. J. Wills. *Machinery* (London), v. 63, no. 1626, Dec. 9, '43, pp. 657-659.

Selection and correct application of abrasives.

20-12. **Securing Fine Surface by Grinding.** H. J. Wills. *Machinery* (London), v. 63, no. 1627, Dec. 16, '43, pp. 690-691.

Wheel selection and speeds.

20-13. **How to Secure Fine Surfaces by Grinding.** H. J. Wills and A. J. Ingram. *Machinery,* v. 50, no. 5, Jan. '44, pp. 173-175.

Balancing of grinding wheels and its effect on fine surface quality.

20-14. **Profiling Shells for Aircraft Cannon.** *Machinery* (London), v. 63, no. 1624, Nov. 25, '43, pp. 589-591.

Description of an automatic profile turning machine used in the production of shells for aircraft cannon.

20-15. **Recent Applications of Carbide Cutters.** Abstract of a paper by H. A. Oldenkamd and James McFayden. *Machinery* (London), v. 63, no. 1622, Nov. 11, '43, pp. 546-547.

Diagrams and descriptions of the application of carbide cutters to processing on turret lathes, to boring machines and planers.

20-16. **Heavy-Duty Gears.** W. P. Schmitter. *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 87-90.

Large industrial and marine gears are hobbed, shaped and shaved to precise specifications. Important complementary factors are alloy content, heat treatment, fabrication of castings, tests, and assembly.

20-17. **Calculations for Screw Machine Cams.** A. Ainsworth. *American Machinist,* v. 88, no. 1, Jan. 6, '44, pp. 91-93.

Five tried methods for figuring thread lobe rise on Brown & Sharpe automatics.

20-18. **Rolls for High Speed Milling—and for Shell Forging.** Nelson G. Meagley. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 91-93.

Problems of tool design, and machinability; "negative rakes" and the cyclonic speeds on aluminum and

magnesium and on steel; metal cutting; forging steel shells. Account of American Society of Mechanical Engineers Dec. '43 Convention.

20-19. **Shaving Aircraft Gears.** Richard S. Kegg. *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 91-94.

Description of processes preceding shaving; reviews the grinding process, and inspection methods employed in precision gear manufacture.

20-20. **Screw Machine Progress.** John E. Hyler. *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 72-76.

Attachments for burnishing, cross-drilling, and eccentric hole drilling.

20-21. **Machining the Wright Cyclone Forged Cylinder Head.** H. E. Linsley. *Iron Age,* v. 153, no. 2, Jan. 13, '44, pp. 46-53.

Special purpose machine tools devised to machine this head are described and illustrated. Machining time has been increased but a difficult and tedious foundry job has been eliminated.

20-22. **Machining Parts for Flying Fortresses.** *Machinery* (London), v. 63, no. 1621, Nov. 4, '43, pp. 505-507.

Boeing production methods.

20-23. **Hyper-Milling with Carbide Cutters.** R. G. O. *Machinery* (London), v. 63, no. 1625, Dec. 2, '43, pp. 617-622.

Normalized wing fittings forged from S.A.E. 4140.

20-24. **Speeding Up Production by Multiple Vertical Turret Lathe Tools.** C. W. Heckert and R. Santoro. *Machinery,* v. 50, no. 5, Jan. '44, pp. 176-177.

Method of using multiple tools for rough-facing parting, finish facing and burring of electrical contact rings machined from a solid brass plate.

20-25. **Grinding Steel Crankcases for Aircraft Engines.** *Machinery* (London), v. 63, no. 1627, Dec. 16, '43, pp. 681-686.

Special methods and equipment.

20-26. **Ideas from Practical Men.** *American Machinist,* v. 87, no. 26, Dec. 23, '43, pp. 99-101.

Nut arbor centers castings on turret lathe; prevents transformer failures on spot welders; lug added to casting simplifies machining; roller replaced by straight shanked stamps; tubing keyways made without machining; inexpensive piercing punches for thin stock; pin gages check bores in small-lot jobs.

20-27. **Ideas from Practical Men.** *American Machinist,* v. 88, no. 1, Jan. 6, '44, pp. 99-101.

Celluloid guards protect Sheffield gages; milling fixture designed for the drill press; diesel locomotive axles ground on a standard lathe; surface grinder attachment for finishing cams; pointed level simplifies burring operation; bar stock transferred vertically to screw machines.

20-28. **Rebuilt Machine Bores Bearings.** C. A. Bloom and Merl Harkless. *American Machinist,* v. 87, no. 26, Dec. 23, '43, p. 93.

A boring spindle added to base of an internal grinder.

20-29. **Carbide-Tipped Cutters Speed Steel Milling.** Fred W. Lucht. *American Machinist,* v. 87, no. 26, Dec. 23, '43, pp. 105-114.

Cutting and relief angles, number of teeth and power, fly-milling cutters, machine requirements, operating precautions, and climb milling vs. conventional milling.

20-30. **Grinding Procedures Set for Glass Gages.** *American Machinist,* v. 88, no. 1, Jan. 6, '44, pp. 83-86.

Close tolerances and transparent finishes on these gages require deviations from usual grinding practices.

20-31. **Diamond Turning.** *Automobile Engineer,* v. 33, no. 444, Dec. '43, pp. 531-532.

Experimental data on the machining of aluminum alloys.

20-32. **Diamond Turning.** *Aircraft Production,* v. 5, no. 62, Dec. '43, pp. 592-594.

Measuring surface finish graphically, cutting data, results.

20-33. **How to Grind Carbide Form Tools.** *Western Metals,* Jan. '44, pp. 15-17.

Steps in training operation for grinding of carbide form tools.

20-34. **Machining, Bending, Straightening, Aluminum Alloys.** G. R. Gwynne. *Western Metals,* Jan. '44, pp. 22-24.

Record of all data of a general or technical nature concerning operations on 14S-T and 24S-T material at the Douglas Aircraft Co. Spar Cap Factory.

20-35. **Streamlined Production: Production Economy with Modern Methods.** *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 78-86.

Includes following topics: Motor frames are machined in balanced operations; grinder head on boring mill; holes drilled in aluminum bronze, drill shanks brazed; shaper and planer tools raised automatically; scrap micarta solves problem of threading slotted studs; gang milling cutter set-up cuts machining time; furnace brazing speeds joining operation, improves product; spot welding fixtures braze electrical contacts; induction heating solders metal to porcelain; spot welding; projection welding; two hinge parts produced simultaneously in press operation; indexing fixture on press saves milling operations; hot pressing; heavy-gauge part blanked; "squirting" produces large copper tubing.

20-36. **Machining the Wright Cyclone Forged Cylinder Head.** H. E. Linsley. *Iron Age,* v. 153, no. 2, pp. 46-53.

Some of the unusual special purpose machine tools devised to machine this head are described and illustrated, the most interesting of which are the automatic units for milling out the cooling fin slots. Machining time has been increased but a difficult and tedious foundry job has been eliminated.

20-37. **Twist Drill Data for the Designer.** C. W. Hinman. *Tool & Die Journal,* v. 9, no. 10, Jan. '44, pp. 86-90.

Designs for drilling jigs and tapping fixtures. Grinding drill points; combination drills; entering drills in

jig bushings; drilling speeds; feed revolution of drill; drilling lubricants and coolants.

20-38. **10-in. by 27-in. Precision Grinding Machines.** *Engineering,* v. 156, no. 4067, Dec. 24, '43, p. 505.

Grinding machines with mechanically-operated table movements. A 10 by 27-in. precision grinding machine, the dimensions referring respectively to the diameter of the maximum swing and the maximum length that can be ground between the workhead and tailstock centers.

20-39. **Screw Machine Progress.** John E. Hyler. *Tool Engineer,* v. 13, no. 1, Jan. '44, pp. 72-76.

Attachments for burnishing, cross-drilling, and eccentric hole drilling are featured in this fourth in a series of articles on increasing the range and functions of automatic screw machines.

20-40. **Heavy Repairs on Steam Locomotives.** Fred B. Stauffer. *The Modern Industrial Press,* v. 5, Jan. '44, pp. 32, 34, 40.

Material conservation achieved by the railroads in conjunction with the national campaign to save critical commodities. Part played by machine tools, from small units to the heaviest categories, in accomplishing the other objectives in rail shop practice.

20-41. **What Knurling Tool to Use on the Screw Machine.** A. Ainsworth. *American Machinist,* v. 88, no. 3, Feb. 3, '44, pp. 88-90.

Each of four types of knurling toolholders for Brown & Sharpe automatics presents a distinct advantage on certain classes of work. Here are suggestions as to best applications for each.

20-42. **Tool-Life Tests.** O. W. Boston. *Mechanical Engineering,* v. 66, Feb. '44, pp. 130-132.

Proposed standard of tool life tests for evaluating the machinability of single-point tools, cutting fluids, or materials cut.

20-43. **Progressive Dies Are Important Tools.** C. W. Hinman. *Modern Machine Shop,* v. 16, Feb. '44, pp. 194-200.

A progressive die for plier handles; order of operations.

20-44. **Practical Ideas From Practical Men.** *American Machinist,* v. 88, no. 3, Feb. 3, '44, pp. 99-104.

Electric light signals keep heavy crane loads level. Improvised set-up for light milling. Rubber mask protects shaft when plating gears. Hand-operated arbor saves machine time. Plastic nameplates formed to cylindrical surfaces. Emery disks break sharp edges on connecting rods. Level squares portable drills. Sliding fixture expedites tapping operations. Cerrobend eliminates denting of aircraft tubing. Single blade on cutter mills radius. Eliminates filing of die-casting molds.

20-45. **Utilization Boards Keep Machines Busy.** H. M. Atwood. *Modern Machine Shop,* v. 16, Feb. '44, pp. 138-148.

Centralized control system that would provide an accurate, up-to-the-minute picture of just how much

each machine in each shop was being used 24 hours per day, along with an indication of the work expectancy for each individual machine.

20-46. **Water Soluble Lubricants.** John H. Richards. *Steel,* v. 115, Dec. 25, '44, pp. 88, 90, 93.

Earlier limitations of "water base" oils overcome through modern emulsifying methods such as homogenizing and their use has contributed to development of higher speed machining practice. Tests indicate new fields for soluble types in lubricating moving parts.

20-47. **Machining Plastics.** W. S. Low, Jr. *Iron Age,* v. 153, no. 6, Feb. 10, '44, pp. 59-61, 137.

Cutting speeds for machining plastics are generally higher than for metals. Different results are obtained with various grades of plastics. Some materials can be finished smoothly with a bronze cutting tool. Abrasive fillers sometimes dull the usual high speed steel cutting tools and necessitate a hard cutting tip such as tungsten carbide.

20-48. **The Operating Principles of Precision Machine Tools.** R. E. Blakey. *Machinery Lloyd,* v. 16, Jan. 8, '44, pp. 37-43.

Design and operation of a precision machine tool is governed mainly by application of basic physical principles, coupled with the logic of mechanical science.

20-49. **A Fixture for Contour Machining.** Robert Mawson. *Steel,* v. 114, Feb. 21, '44, p. 91.

With this type of machine tool fixture, intricate shapes can be produced at low cost with minimum waste of material. This fixture is designed to make concave and convex shapes.

20-50. **Is Milling Being Revolutionized?** Guy Hubbard. *Steel,* v. 114, Feb. 21, '44, pp. 76-77.

In the light of past history, current events in tool engineering indicate that next move will be up to machine tool builders. Significant developments in metal working.

20-51. **Increasing Tool Life by Better Tool Finishing.** V. H. Ericson. *Mechanical Engineering,* v. 66, no. 2, Feb. '44, pp. 107-110.

Tool grinding procedures; tool finishing; sharpening gear cutters; advantages of keener edge and high surface finish.

20-52. **Bedding-in Lathe Carriages by Power.** *American Machinist,* v. 88, no. 4, Feb. 17, '44, p. 93.

Bedding-in and aligning big engine lathe carriages at the Monarch Machine Tool Co. is now done by a power-driven device which materially reduces manpower required for the job. The operation consists of moving the lathe carriage back and forth the length of the lathe ways, determining the bearing spots and scraping these so that when the job is finished the carriage will run smoothly along the lathe bed.

20-53. **Practical Ideas From Practical Men.** *American Machinist,* v. 88, no. 4, Feb. 17, '44, pp. 99-104.

Dividing head speeds machining of castle nuts; assembly fixture holds gears in alignment; continuous

lubrication for loose pulleys; burrs removed semi-automatically from screws; redesigned gage blocks save steel; painting rack eliminates masking; portable tool speeds locomotive repairs; circular tool removes burrs from cylinders; truck attachments simplify materials handling; bell-cap center punch insures accurate drilling; tool devised for airloc fasteners.

20-54. **Chevrolet Develops Low-Cost Cutters for Finning P. & W. Pistons.** *American Machinist,* v. 88, no. 4, Feb. 17, '44, pp. 83-87.

Cutter blades better able to withstand conditions peculiar to milling cooling fins inside the piston are now being made upon a production line basis. Cutter cost has been reduced 75%.

20-55. **Disintegrator Drilling.** *Steel,* v. 114, no. 8, Feb. 21, '44, p. 92.

Removes broken drills, taps, reamers without damaging work piece.

20-56. **Grinding Steel-Cutting Carbide Tools.** W. L. Kennicott. *Machinery,* v. 50, Feb. '44, pp. 158-161.

Correct methods of grinding carbide tools for cutting steel will greatly prolong the life of the tools and increase cutting efficiency, thereby reducing costs.

20-57. **A Method for Determining Speeds and Feeds for Milling Operations.** S. C. Bliss. *Machinery,* v. 50, Feb. '44, pp. 153-157.

To get the most out of milling machines and cutters, the most effective feeds and speeds must be used. This article describes how these were determined in one war production plant.

20-58. **Automotive Techniques Cut Production Costs.** *Tool Engineer,* v. 13, Feb. '44, pp. 72-80.

Machining: milling, broaching, boring, grinding; special machines; work location; materials handling; forging shell cavities; materials conservation.

20-59. **Multiple Piercing Die for Aircraft Parts.** *Iron Age,* v. 153, no. 7, Feb. 17, '44, pp. 69-73.

In order to coordinate the rivet holes in the assembly of the 10 pieces which make up a catwalk for the Boeing Flying Fortress, a flexible piercing die has been devised which will accommodate itself with minor adjustments to piercing of flats, angles and T-sections. Use of manually operated side guides or stock pushers largely makes this possible.

20-60. **Boeing's "Porcupine."** *Tool Engineer,* v. 13, Feb. '44, pp. 91-92.

Piercing die produces 388 holes simultaneously in Flying Fortress part. In piercing nine other parts, to produce a total of 976 rivet holes, it handles gages ranging from 0.064 to 0.150 in. Hole location accuracy is to 0.0005 in., even where 0.167 in. holes are only 0.5 in. apart on centerline.

20-61. **Attachments that Increase Versatility of High-Production Grinding Machines.** H. E. Balsiger. *Machinery,* v. 50, Feb. '44, pp. 147-152.

The answer to how a wider variety of work is being handled by the application of properly designed attachments to grinding machines.

20-62. **Profile Boring on Multi-Tool Lathe.** S. Smith. *Machinery (London)*, v. 64, Jan. 13, '44, p. 41.

Design of device to enable pro-boring operations to be performed on a B.S.A. multi-tool lathe.

20-63. **Grinding Aero-Engine Crankcases.** *Machinery (London)*, v. 64, Jan. 6, '44, pp. 11-13.

Construction of the machines for production of steel crankcases.

20-64. **Increase Your Machine Range.** A. E. Rylander. *Tool Engineer*, v. 13, Feb. '44, pp. 68-70.

Besides highlighting universal features of the horizontal boring mill, this article considers possibilities of turning on the milling machine and of mounting a small lathe cross-wise to an open-belt machine. Ideas presented concerning turning a large wheel, cutting a gear when the equipment is under the required range.

20-65. **How to Secure Fine Surfaces by Grinding.** H. J. Wills and H. J. Ingram. *Machinery*, v. 50, Feb. '44, pp. 167-170.

Ninth of a series—discusses the subject of coolants.

20-66. **Toggle Lever Drill Jigs.** C. W. Hinman. *Tool & Die Journal*, v. 9, Feb. '44, pp. 87-92.

Modern designs for drilling jigs and tapping fixtures.

20-67. **High Production Broaching of Drive Spline Inserts.** *Tool & Die Journal*, v. 11, Feb. '44, pp. 107-108.

Method of cutting deep slots in alloy steel drive spline inserts for aircraft hydraulic disc brakes.

20-68. **Using Machine Tools to Best Advantage.** W. K. Bailey. *Machinery (London)*, v. 64, Jan. 20, '44, pp. 65-68.

Discussion of the rearrangement of work and equipment to reach the necessary production goals without new machines.

20-69. **Direct-Current Adjustable-Speed Drives for Machine Tools.** G. A. Caldwell. *Machinery (London)*, v. 64, Jan. 20, '44, pp. 69-72.

Description of a self-excited shunt adjustable-voltage drive.

20-70. **Reclaiming Carbide Tool Tips.** *Metal Treatment*, v. 10, Winter, '43-'44, pp. 262, 265.

Procedure employed at the Aircraft Engine Division of the Ford Motor Company (U. S. A.) for the recovery of tungsten-carbide tool tips.

20-71. **Dressing Grinding Wheels Without Diamonds.** Von Heinz Frank. *Engineers' Digest*, v. 1, Feb. '44, pp. 176-177.

Description of a dressing tool of a disc especially mounted in a holder.

20-72. **A Novel Method for Sharpening Ragged and Knobbling Rolls.** O. Rademacher. *Engineers' Digest*, v. 1, Feb. '44, pp. 175.

Description of roll sharpening lathes in steel mill practice.

20-73. **Band Sawing, Filing, and Polishing.** J. H. Bird. *Metal Treatment*, v. 10, Winter, '43-'44, pp. 225-232.

Combination sawing, filing and polishing band ma-

chines are discussed and the developments leading up to the present high efficiency. Also deals with the training of operators, and refers to experimental work in progress in the U. S.

20-74. **Zinc-Alloy Cast Jaws Facilitate Machining Operations.** *Machinery (London)*, v. 64, Jan. 20, '44, pp. 73-74.

Production of jaws from a commercial type of fusible alloy led to casting the jaws from a zinc-base alloy (Kirksite A) because of the need for a harder and more durable material.

20-75. **Grinding of Tools.** Kark Lüdtke. *Engineers' Digest*, v. 1, Feb. '44, pp. 177-179.

Grinding punches to required shape immediately after machining and hardening. Working allowance from 0.3 to 0.4 mm given. Profile grinding wheels, copy-grinding and use of templates.

20-76. **Practical Ideas from Practical Men.** *American Machinist*, v. 88, March 2, '44, pp. 99-104.

Handwheel spokes burred on the drill press. Expanding arbor cuts lathe set-up time. Grease gun adapted for oiling lathe centers. Gage sets flame cutting torches quickly. Thumb jack supports long work for milling. Spotfacing tool reaches offset holes. Angle gages check accuracy of pipe bends. Washer prevents collets from collecting chips. Adaptors for riveter eliminate hand work. Limit gage has wide range of settings.

20-77. **A Machine Tool Builder Makes Naval Diesel Engine Cases.** George L. Kluter. *Iron Age*, v. 153, March 2, '44, pp. 40-45.

Faced with a rapid decline in turret lathe business, Warner & Swasey Co., Cleveland, took a contract for machining destroyer and submarine type diesel engine cases and developed some unique ideas in setup and tooling.

20-78. **How to Obtain Longer Tool Life.** E. T. Larson. *Steel*, v. 114, March 6, '44, pp. 136, 168, 170.

Methods of Norton Co. in reclaiming milling cutters, end mills, counterbores and drills.

20-79. **New Technique in Milling.** Orlan W. Boston. *Metal Progress*, v. 45, March '44, pp. 481-483.

Machining and ruting of aluminum aircraft parts have been done at such extraordinary speed that the whole problem of tools and machinery for cutting metals—especially steel—is again under scrutiny.

20-80. **Machining Coarse - Grained Zinc.** Gerald Edmunds. *Metal Progress*, v. 45, March '44, p. 509.

How to avoid cleavage fractures when coarse-grained zinc is machined.

20-81. **Thread Milling.** *Automobile Engineer*, v. 34, Feb. '44, pp. 79-81.

Developments in special-purpose machines.

20-82. **Cemented Carbides.** M. Littmann. *Automobile Engineer*, v. 34, Feb. '44, pp. 59-62.

Recent German practice in the application of several grades of cemented carbides to various tools.

20-83. **Stellite Faced Valve Machined with Carbides.** *Iron Age,* v. 153, March 9, '44, p. 60.

Machining of Stellite and steel simultaneously with the same cutting tools on a mass production basis by Thompson Aircraft Products Co., Euclid, Ohio.

20-84. **Milling Steel with Carbide Tipped Cutters.** Fred W. Lucht. *Iron Age,* v. 153, March 16, '44, pp. 56-63.

Compares fly milling with the action of a single point tool taking an interrupted facing cut in a lathe and shows why negative axial rake angles are desirable for maximum cutter life. Exhaustive analysis of all the cutter angles.

20-85. **End Milling Gets the "Speed-up."** Guy Hubbard. *Steel,* v. 114, March 13, '44, pp. 100, 102.

Air turbines and high-frequency electric motors, already well entrenched in woodworking field, are crashing gates of machine tool industry.

20-86. **Cemented-Carbide-Tipped Milling Cutters.** Fred W. Lucht. *Mechanical Engineering,* v. 66, March '44, pp. 192-198.

Design considerations in applying cemented carbides, multitooth cutters, design of cutter body, fly cutting, rigidity in milling, operating precautions.

20-87. **Chip Control with Sintered-Carbide-Tipped Tools.** Malcolm F. Judkins. *Mechanical Engineering,* v. 66, March '44, pp. 201-202.

Factors in chip formation, methods of controlling chips, ground-in-chip groove, procedure for grinding grooves.

20-88. **Selection and Application of Milling Cutters.** *American Machinist,* v. 88, March 16, '44, pp. 113-124.

Hand of rotation; selection of milling cutters; profile-type milling cutters; shaped profile cutter; formed milling cutters; inserted tooth milling cutters; proper application of milling cutters; care of milling cutters; sharpening practices are important.

20-89. **Practical Ideas.** *American Machinist,* v. 88, March 16, '44, pp. 107-112.

Hand tool controls dimensions on forgings. Ring prevents toolholder from spreading. Templet locates airplane camera window accurately. Indicator location changed on grinder. Combined push-pull adjustment screw. Tubing drill jig has quick-loading features. Lock added to cable connectors. Slotting cutters ground to form cut-off tools. Cement reclaims damaged masonite form blocks. Indicator measures diameter of small holes. Sheet-metal gage checks size of bored holes. Adjustable tool spotfaces curved deck plates.

20-90. **Combined Shop Ideas Improve Tooling Set-Up.** A. Ainsworth. *American Machinist,* v. 88, March 16, '44, pp. 102-104.

Teamwork among set-up men, shop supervisors and tooling engineers results in cheaper and more effective layout for producing fuze bodies on automatic lathes.

20-91. **Tooling the Automatic Screw Machine, IX.** Noel Brindle. *Modern Machine Shop,* v. 16, March '44, pp. 162-164, 170, 172, 174, 176, 178, 180, 182, 184.

Methods of eliminating the burr raised by cutting-off. Design of recessing tools.

20-92. **For Versatility—the Drill Press.** John E. Hyler. *Modern Machine Shop*, v. 16, March '44, pp. 206-208, 210, 212, 214, 216, 218, 220, 222, 224, 226.

Drill press adapted to perform a wide variety of operations other than that for which it was intended.

20-93. **Clipping and Broaching Operations on Die Castings.** B. D. S. *Machinery* (London), v. 64, Jan. 27, '44, pp. 106-108.

Construction and operation of clipping dies for removal of flash or fin of metal at the parting line.

20-94. **Method of Grinding Crankshafts on Centreless Grinders.** E. E. Fluskey. *Machinery* (London), v. 64, Jan. 27, '44, pp. 97-98.

Method of grinding single-throw crankshafts on a standard centreless grinder. It is also possible to grind double-throw crankshafts, also components where there are two different diameters which are to be concentric, thus eliminating the necessity of dressing steps in expensive grinding wheels to conform to the diameters required.

20-95. **Practical Application of Quality Control.** W. A. Bennett and J. W. Rodgers. *Machinery* (London), v. 63, Dec. 30, '43, pp. 737-740.

Ten per cent saving in production costs are being effected by dimensional quality control in a factory making small metal components to close tolerances on single- and multi-spindle automatics. Machine efficiency has increased 14% and 70% inspection labor hours have been saved.

20-96. **Modern Machine Tool Production.** T. P. N. Burness. *Machinery* (London), v. 64, Jan. 27, '44, pp. 101-102.

Standardization practice for the machine tool builder. Drawing office, records department, inspection department, metallurgical department, repetition basis in machine-tool production, machine moulding, operatives.

20-97. **How to Get the Most Out of Carbide Tools.** *Machinery* (London), v. 63, Dec. 30, '43, p. 735.

Examples of carbide tools in armament work; results obtained by hyper-milling.

20-98. **Hydraulic Machine Speeds Back-Spotfacing of Cylinder Barrel Bolt Holes.** *Product Engineering*, v. 15, March '44, pp. 154-156.

Back-spotfacing operations on cylinder barrel flanges have been eliminated through the development of a multiple-spindle hydraulic machine which spotfaces 20 bolt holes in one set-up. Production rate is 26 or more cylinder barrels per hour. Designed and manufactured by Snyder Tool & Engineering Co.

20-99. **Screw Machine Progress.** L. D. Spence. *Tool Engineer*, v. 13, March '44, pp. 87-90.

Varied arrangements of spindle speeds and increased r.p.m. have met machining requirements of modern materials. Supplementary advantages are accessories and improved attachments which reduce idle time.

Automatic screw machine advancement is traced through developments of the Brown & Sharpe Co.

20-100. **Tooling to Machine Heavy Castings.** Jerome Wilford. *Tool Engineer,* v. 13, March '44, pp. 67-70.

Design and construction of a 32-ft. vertical honing machine and the use of cast boring bars, are typical Cooper-Bessemer tooling developments, applied to boost production efficiency.

20-101. **Is Magnesium a War Baby?** Wallace Scotten. *Tool Engineer,* v. 13, March '44, pp. 99-102, 104.

Less than ¼ the weight of iron, magnesium has a war record of revolutionary functional advantages which promise increased attention from designers. Fabricating problems are outweighed by ease and economy of forming and machining.

20-102. **Jig Boring at Full Capacity.** Frank O. Hoagland. *Tool Engineer,* v. 13, March '44, pp. 71-75.

What a working drawing should contain, why expansion affects tolerances, how the rotary table is used, and how the jig borer can serve as an inspection tool, are pointers to economical production.

20-103. **Negative-Rake Milling a Revolutionary Development in Shop Practice.** Charles O. Herb. *Machinery,* v. 50, no. 7, March '44, pp. 138-157.

Production experiences of prominent aircraft companies who have pioneered in the development of the new milling technique that has achieved such startling results.

20-104. **Milling Aluminum at Cutting Speeds up to 19,000 Feet a Minute!** J. S. Haldeman. *Machinery,* v. 50, no. 7, March '44, pp. 176-182.

Practice in a plant of the Lockheed Aircraft Corp. on milling machines equipped with spindles driven by high-cycle motors.

20-105. **Turning With Negative-Rake Lathe Tools.** *Machinery,* v. 50, no. 7, March '44, pp. 183-185.

Very heavy cuts can now be taken on alloy steel with carbide tools. Forgings for these gun barrels were made from high nickel-chromium steel.

20-106. **Multiple-Tool Steel Turning With Carbide-Tipped Cutters.** Ralph Granzow. *Machinery,* v. 50, no. 7, March '44, pp. 187-189.

Information concerning the proper nose radii, rake, and chip-breaker width on tools for turning steel.

20-107. **Taper Line-Reaming Ship Drive-Shaft Flanges.** George D. Bowman. *Machinery,* v. 50, no. 7, March '44, pp. 195-196.

Portable machine tool mounted on a drive-shaft to line-ream tapered holes through flanges of ship line and propeller shafts. Holes reamed within a tolerance of 0.001 in.

20-108. **Power Required in Milling With Negative-Rake Cutters.** Hans Ernst. *Machinery,* v. 50, no. 7, March '44, pp. 197-199.

Results of investigations conducted by the research laboratory of the Cincinnati Milling Machine Co.

20-109. **How to Secure Fine Surfaces by Grinding.** H. J. Wills. *Machinery,* v. 50, no. 7, March '44, pp. 211-213.
Fundamentals of lapping.

20-110. **The Precision Machining of Magneto Housings.** Edward H. Moll. *Die Casting,* v. 2, no. 3, March '44, pp. 20-21.
Precision machining is required on the main housing of the aircraft engine magnetos manufactured by the American Bosch Corp. By providing first rate machine tools and equipping them with excellent jigs and fixtures it is possible to produce completely machined die cast housings held within the narrow dimensional limits specified and to do it with economy on a quantity production basis.

20-111. **Precision Contouring Is Done Automatically.** Guy Hubbard. *Steel,* v. 114, March 27, '44, pp. 90, 92, 120, 122.
Cycle control through instruments which operated "in reverse." They translated ideal graphs of time and temperature conditions back to the process itself, thus effecting automatic control of the process.

20-112. **Recessed Jigs.** C. W. Hinman. *Tool & Die Journal,* v. 9, March '44, pp. 98B-98F.
Modern designs for drilling jigs and tapping fixtures.

20-113. **Apprentice Training.** E. S. Webster. *Army Ordnance,* v. 26, March-April '44, pp. 299-302.
Watervliet Arsenal's program for developing skilled machinists.

20-114. **Operations on 90-mm. Anti-Aircraft Gun Mountings.** *Machinery* (London), v. 64, Feb. 24, '44, pp. 205-209.
Component parts are welded and machined in special fixtures that ensure complete interchangeability in the ship and in the field.

20-115. **Turning and Other Operations on Die Castings.** B. D. S. *Machinery* (London), v. 64, Feb. 24, '44, pp. 217-219.
Choice of location surfaces, dimensions liable to vary, tooling, spinning operations.

20-116. **Special Chuck for Internal Grinding Machines.** E. Boneham. *Machinery (London),* v. 64, Feb. 17, '44, pp. 181-182.
Self-centering chuck described and illustrated.

20-117. **Cutting Oils.** T. R. Kidd. *Machinery (London),* v. 6, Feb. 17, '44, pp. 182-183.
Research on cutting fluids, water-soluble oils, neat cutting oils.

20-118. **Production Milling.** *Automobile Engineer,* v. 34, March '44, pp. 102-106.
Application of this process to repetition manufacture.

20-119. **Seven-Spindle Horizontal Automatic for Machining Large Work-Pieces.** E. Dornhöfer. *Engineers' Digest,* v. 1, March '44, pp. 209-211.
Construction of a horizontal machine with seven radially arranged spindles, in which six tool slides are embodied, the seventh headstock and spindle being used for chucking operations. The spindles are carried in seven identical headstocks fixed on a round rotatable

table, the latter in turn resting on a base bolted to the foundation. Each tool slide likewise forms, with its bed and drive, an integral unit bolted to the foundation.

20-120. **Gear Grinding.** *Engineers' Digest,* v. 1, March '44, pp. 246-247.
Helical gear grinding, lead measurement, spline shaft grinding.

20-121. **Surface Finish.** W. E. R. Clay. *Institution of Automobile Engineers Journal,* v. 12, March '44, pp. 8-23.
Diamond and carbide-tipped tool turning, boring, and milling; reaming; broaching of bores (for finish); polishing; rolling; scraping; grinding; honing; superfinishing; lapping.

20-122. **Roll-Turning Lathe.** *Iron & Steel,* v. 17, March '44, pp. 295-296.
Heavy duty machine for rolls up to 30 in. diameter.

20-123. **Production of Mountings for 90-Mm. Anti-Aircraft Guns.** *Machinery (London),* v. 64, March 2, '44, pp. 231-235.
Machining as carried out by the General Motors Corp.

20-124. **Universal Screw Threads.** Harry F. Atkins. *Machinery (London),* v. 64, March 2, '44, pp. 241-243.
Form, pitch, limits.

20-125. **Machining Armour-Piercing Shot.** H. L. H. *Machinery (London),* v. 64, March 9, '44, pp. 253-257.
Operations on vertical automatics.

20-126. **Machining Set-Ups for Valve Guide.** "U." *Machinery (London),* v. 64, March 9, '44, pp. 265.
Methods for production of stop valves and costs kept in estimated figures.

20-127. **Advanced Techniques Solve Machining Problems.** *Aero Digest,* v. 44, March 15, '44, pp. 102, 104.
Precision parts for airplane engines. All parts are of a critical nature, with close tolerances and complicated structures. Machined from forgings; correction after heat treatment; external thread ground.

20-128. **Multiple Cutting of Tubing.** *Iron Age,* v. 153, March 30, '44, p. 45.
Use of a plain wooden block, cut in the shape of a V, bound on the sides by a piece of canvas and topped off with a snap fastener, has speeded up tube cutting.

20-129. **Hobbing Speeds Production of Bullet Dies.** John Zubell. *American Machinist,* v. 88, March 30, '44, pp. 93-96.
Dies hobbed to eliminate contour machining and grinding must be lapped between rough and finish hobbing operations to remove all tool marks. Tungsten dies can be resized to compensate for wear.

20-130. **Slidefilms Form Basis for Shop Training.** Lyne S. Metcalfe. *American Machinist,* v. 88, March 30, '44, p. 97.
Use of slidefilms to teach fundamental practices in machine tool and other metal-working operations saves as much as 40% of the time generally needed to train production workers.

20-131. **Practical Ideas.** *American Machinist,* v. 88, March 30, '44, pp. 107-112.

Compound die for sheet-steel punchings. Fixture indexes round stock for milling squares. Small-hole gage has micrometer thimble. Press tools set grommets in braided wire. B. & O. designs new engine-house vise bench. Redesigned casting simplifies drilling oil holes. Micrometer readings corrected by second index line. Plug gages made from drill rod. Tool drives Riv-Nuts in close quarters.

20-132. **Ground Spherical Fits Reduce Manufacturing Time.** J. R. Miller. *American Machinist,* v. 88, March 30, '44, pp. 100-103.

Interchangeability of parts achieved by elimination of lapping to fit mating concave and convex bearing surfaces on 90-mm. anti-aircraft gun unit.

20-133. **Tooling the Automatic Screw Machine, X.** Noel Brindle. *Modern Machine Shop,* v. 16, April '44, pp. 196, 198, 200, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228.

Thread rolling, skiving, and shaving operations, and design of tools for performing these operations.

20-134. **Deflections and Chatter in Machine Tools.** George E. Hieber. *Product Engineering,* v. 15, April '44, pp. 269-271.

Bending and torsional deflections in machine tools and the importance of calculating their accumulated effects as a procedure in design for the purpose of reducing vibrations or chatter and improving machine tool performance. Fundamental principles reviewed and applied to a few typical designs of bed, headstock and gearbox.

20-135. **Unusual Jobs on the Horizontal Boring Mill.** E. E. Wagner and George R. Holt. *Tool Engineer,* v. 13, April '44, pp. 67-70.

The horizontal boring, drilling, and milling machine's wide adaptability may offer an economical and time-saving solution to your shop headaches. Several examples of smart tooling with this equipment are described here.

20-136. **Milling With Fly Cutters.** Ralph R. Weddell. *Tool Engineer,* v. 13, April '44, pp. 85-89.

Are fly cutters a compromise with present-day equipment? An expert reveals the relation of number of teeth in the cutter to the work, the fixture and available horsepower.

20-137. **High Production Honing Without Fixtures.** A. F. Hasty. *Tool Engineer,* v. 13, April '44, pp. 93-94.

Honing is a machine operation which supplements grinding, boring, reaming and broaching. It is used to generate roundness and to produce surface finishes as fine as one micro-inch.

20-138. **388-Punch Piercing Die.** *Steel,* v. 114, April 3, '44, pp. 126, 129.

Pierces 976 holes in ten different parts with an accuracy of 5/10,000ths of an inch at speed 30 times that of former methods.

20-139. **Precision Fixtures.** H. V. Wenger. *Steel,* v. 114, April 10, '44, pp. 102-103, 152-153.

Reduce machining problems, cut costs 35%.

20-140. **Broaching Speeds Output of Airplane Brake Shoe Parts.** *Steel,* v. 114, April 10, '44, p. 112.

Broaching process removes rapidly large amounts of stock and at the same time obtains extreme accuracy with high production.

20-141. **The Future of the Machine Tool Industry.** Max Leach. *Iron Age,* v. 153, April 13, '44, pp. 56-59.

Future of the industry in the next decade depends largely upon the policy adopted by government in the disposal of surplus machine tools.

20-142. **Gooseneck Carbide Tools.** Gaylord G. Thompson. *Iron Age,* v. 153, April 13, '44, pp. 68-70.

Running counter to the accepted practice that carbide tools must be clamped solid for efficient cutting of metal, the author advocates the use of carbide tools with gooseneck shanks to absorb the shock present on interrupted cuts. Two forms of gooseneck tool holders that proved successful on a specific job.

20-143. **Contour Control Device Uses Air Gage Principle.** *Iron Age,* v. 153, April 20, '44, pp. 85, 174.

Contour control which employs the principle of the precision air measuring gage to obtain high accuracy in the automatic operation of machine tools.

20-144. **Grinding to Ten-Thousandths Inch on a High-Production Basis.** Ralph Price. *Machinery,* v. 50, April '44, pp. 154-155.

Methods and equipment used for high-production grinding of work that is held to size within tenths of a thousandth of an inch.

20-145. **Care and Use of Thread-Cutting Dies.** M. B. Henneberger. *Machinery,* v. 50, April '44, pp. 166-169.

Recommended practice in maintenance and application of thread-cutting dies with tangential type chasers.

20-146. **Obtaining Sensitivity with Air-Hydraulic System.** F. A. Barnes and C. Johnson. *Machine Design,* v. 16, April, '44, pp. 155-158.

Combination of pneumatics and hydraulics to provide extreme sensitivity in the contour-turning unit. Utilizing a thin metal templet as a master, the unit controls turning, boring and facing operations automatically within 0.0002 in.

20-147. **Drilling Angularly Related Holes.** C. W. Hinman. *Tool & Die Journal,* v. 10, April '44, pp. 96-100.

Jig cradles, drilling angular holes without cradles, tooling conditions for drilling angular holes, speeds for individual drills in a group, multiple drilling heads.

20-148. **Swarf in Grinding Machine Coolants.** *Machinery (Lloyd),* v. 16, March '44, p. 43.

"Churchill" patented swarf separator consists of a circular tank in which the effluent from the grinding machine flows across a sloping trough and thence down a tilted spout which causes the liquid to take a circular motion and deposit the swarf on the outer perimeter of the tank.

20-149. **Drummond Maxicut Lathes.** *Machinery (Lloyd)*, v. 16, March '44, pp. 44-45.

Drummond Maxicut lathe has been specially designed for turning and finning aero engine cylinders and has been stripped of all unnecessary mechanisms which, for the present, are not required and would only detract from the simplicity of the machine. The lathe is capable of machining the concentric and eccentric fins of radial aero engine cylinders at an extremely high rate of output.

20-150. **Thread Milling Cutters.** *Machinery (Lloyd)*, v. 16, March '44, pp. 46-47.

Thread milling is a development of form milling and the shape of the threads cut depends upon the accuracy and precision of the machine as well as that of the cutter.

20-151. **Points to Watch in Drill Jig Design.** C. W. Hinman. *American Machinist*, v. 88, April 27, '44, p. 105.

Body construction, strength, pack case hardening, clearing jig handles, easy handling, location of hinge pins, equalizers, work supports, relation of work piece to the drill, feet, bushings, drill burrs, cleaning jigs.

20-152. **Practical Ideas.** *American Machinist*, v. 88, April 27, '44, pp. 111-116.

Rollers speed sawing of aluminum sheet. Fixture speeds inspection of rollers. Precision rings made in pairs. Simplified method of cutting magnesium. Sander removes box markings. Magnetic guide aligns tap. S-hooks formed by bench fixture. Reducing tap breakage. Fixed caliper arms for turning shouldered shafts. Slot checked with flush-pin gage. Quick action lid for drill jigs.

20-153. **High-Speed Steel Tipped Tools and Tool Grinding.** James Farmer. *Machinery* (London), v. 64, March 16, '44, pp. 287-290.

The butt-welded tool, the brazed or tipped tool, preparation of the tips, re-conditioning roller-type milling cutters.

20-154. **Effect of Tooth Clearance on Milling-Cutter Performance.** S.C.B. *Machinery* (London), v. 64, March 16, '44, pp. 291-293.

Too small a clearance angle and too wide a land, combined with too fast a feed relative to the cutter speed, may cause work-hardening of the piece being milled.

20-155. **Securing Fine Surfaces by Grinding.** H. J. Wills. *Machinery* (London), v. 64, March 16, '44, pp. 294-296.

Dressing tools, diamond dressing tools, holding the diamond in the tool, dressers or dressing tools with several diamonds.

20-156. **Hints on Multple Tool Steel Turning With Carbides on Tomorrow's Machines.** Ralph Granzow. *Machine Tool Blue Book*, v. 40, May '44, pp. 174, 176, 178, 180, 182, 184.

To meet increased production demands in the manufacture of war equipment, use of carbides on multiple

tool set-ups for the turning of steel. Shell turning lathes—equipped with motors having horsepower ratings of 50, 75, and even as high as 100 to obtain the maximum rate of metal removal.

20-157. **Roughing with Carbides.** W. L. Kennicott. *Machine Tool Blue Book,* v. 40, May '44, pp. 277-278, 280, 282.

Overall efficiency of operation, considering life of the tools, grinding time and down-time of the machine, is better at lower speeds with positive angles and at higher speeds with negative angles.

20-158. **Fewer Cutter Teeth Improves High Speed Steel Milling.** Fred W. Lucht. *Machine Tool Blue Book,* v. 40, May '44, pp. 287-288, 290-292.

Tests demonstrate that by reducing number of cutting teeth and maintaining speed, production is increased.

20-159. **Sulphurized Cutting Oils.** A. F. Brewer. *Steel,* v. 114, May 1, '44, pp. 104-105, 141-142, 144, 146, 148.

No cure-all for machining difficulties but find wide usage where better heat transfer, more rapid cutting and smoother surface finish are important factors.

20-160. **Machining Cylinder Fins.** *Aircraft Production,* v. 6, April '44, pp. 155-156.

Special-purpose maxicut lathe for aero-engine work.

20-161. **Machining 57-Mm. Anti-Tank Gun Barrels.** *Machinery,* v. 64, March 23, '44, pp. 309-314.

Straightening is very important during the manufacture of gun barrels, and is performed four times during the finishing operations. Taper boring cuts on the powder chamber are performed on a turret lathe. Tapered and straight grinding cuts are taken on the powder chamber by a chucking grinder. Gun barrels are rifled by employing 25 disc-like broaches.

20-162. **Industrial Diamonds.** F. G. Rockwell. *Mining and Metallurgy,* v. 25, May '44, pp. 257-259.

Cemented carbides and synthetic abrasives are exceedingly hard, and have found wide use, but the diamond will scratch any of them. This property has made it invaluable in fine sizes for grinding and polishing, and as coarser stones for drilling, machining, shaping, and as dies for wire drawing. Much of our super war equipment would have suffered greatly in quality if we had not had large stocks of diamonds, and if we could not get more from Africa. Our requirements for this type of material have increased enormously.

20-163. **Applying Carbide Tools on Automatic Screw Machines.** Otto Guttman. *Iron Age,* v. 153, May 4, '44, pp. 62-66.

Taking as an example the tooling of an eight spindle automatic for 20-mm. tracer shells, shows that in order to safely employ the higher peripheral speeds required for turning with carbide form tools, smaller H.S.S. drills must be selected for the initial boring operations. The cavity is subsequently brought to size with a carbide gun drill and a carbide reamer. Some unconventional tool forms are illustrated.

20-164. **Temperature Distribution in Lathe Cutting Tools.** G. Pahlitsch and H. Helmerdig. *Engineers' Digest,* v. 1, April '44, pp. 283-287.

Application of the incremental method to a lathe cutting tool; thermodynamic fundamentals; determination of the increment scale; thermal considerations; the amount of heat absorbed by the tool.

20-165. **X-rays and Industrial Diamonds.** E. J. Tunnicliffe. *Engineers' Digest,* v. 1, April '44, pp. 292-293.

By examining every tool by X-rays, unsatisfactory settings may be easily discovered and the diamond remounted. In addition, the size and shape of mounted diamonds may be determined when the question arises of resetting worn or damaged stones or those that have been incorrectly set.

20-166. **Engineered for Machining, II.** John R. Ehrbar. *Die Casting,* v. 2, May '44, pp. 27, 29-30.

Each step in machining a die cast part is described in detail—assuming the use of simple machine tools available in almost any plant. Obviously, many of the operations could be simpler with a complete setup of machine tools and equipment.

20-167. **High-Speed Milling with Negative Rake Angles.** Hans Ernst. *Mechanical Engineering,* v. 66, May '44, pp. 295-299.

New procedure in the milling of steel, viz., the utilization of sintered-carbide cutters, with negative rake angles, operated at cutting speeds appreciably higher than formerly thought practicable even with these exceedingly hard cutting materials.

20-168. **Determining Tool Efficiency in High-Speed Milling.** Wallace E. Brainard. *Mechanical Engineering,* v. 66, May '44, pp. 301-302.

Development of a simple and accurate method of comparing and evaluating various designs of high-speed milling cutters, measuring loads directly at the cutter and equating these in terms of material removed. The cutter holder is treated as a beam, and a strain gage is used to measure applied loads.

20-169. **Two Examples of High-Speed Milling.** F. W. Lucht. *Mechanical Engineering,* v. 66, May '44, pp. 303-304.

Two methods for improving the operating conditions for a given job. In one case, the cutter had too many teeth, and a reduction in the number of teeth increased the chip load and improved the operating conditions. In the other case, the number of teeth was reduced to one, in order to keep within the power available, to eliminate a grinding bottleneck, to increase the chip load, and to improve the operating conditions.

20-170. **Why High-Speed Milling?** Wallace E. Brainard. *Tool Engineer,* v. 13, May '44, pp. 67-71.

Conventional milling equipment cannot take full advantage of the machinability of aluminum alloys. A redesigned machine and advanced methods of determining tool efficiency permitted applying speeds and feeds far beyond accepted practice.

20-171. **Three Applications of Electronic Drive to Lathes and Milling Machines.** B. T. Anderson. *Tool Engineer,* v. 13, May '44, pp. 86-88.

For machining a spiral groove, production engineers selected an automatic lathe with electronic drive. Cam mounted on back of face plate guides rear tool slide. Electronic control provides constant surface speed at the tool, and rapid return.

20-172. **Electronic Control Applied to Grinding Machines.** R. A. Cole. *Tool Engineer,* v. 13, May '44, pp. 89-90.

To apply an electronically controlled, adjustable-speed motor to the grinding machine, consideration must be given the elements of the machine and the types of controls required. Types of drive units, hydraulic motors, grinder requirements, motor-generator sets; wide speed range, optimum capacity.

20-173. **Broaching Fundamentals and Application.** Arthur Burgan. *Tool Engineer,* v. 13, May '44, pp. 91-94.

Round-hole broaching, broaching irregular shapes, chip breakers, surface broaching, broach maintenance, broach sharpening, automatic broach puller.

20-174. **Carbides: Something New in Taps.** Wallace Scotten. *Tool Engineer,* v. 13, May '44, pp. 101-102, 105.

Foreshadowing wider utilization of carbides in taps is the successful application of the material in a tool now produced for an aircraft engine job.

20-175. **Grinding to Ten-Thousandths Inch on a High-Production Basis.** Ralph Price. *Machinery,* v. 50, May '44, pp. 158-161.

Methods and equipment used for high-production grinding of work that is held to size within tenths of a thousandth of an inch.

20-176. **Faster Tool Grinding With Cup-Wheels.** R. D. P. *Machinery* (London), v. 64, March 30, '44, pp. 345-346.

Grinding on the face of a cup-wheel gives a flat clearance, not under-cut.

20-177. **High Speed Precision Tapping Requires Proper Choice of Equipment.** Herman Goldberg. *American Machinist,* v. 88, May 11, '44, pp. 94-96.

Pertinent facts to get optimum results and maintain high production.

20-178. **Practical Ideas.** *American Machinist,* v. 88, May 11, '44, pp. 103-108.

Tandem die for piercing angle plates. Swedging tool flares large copper pipe. Adjustable lathe stop speeds boring operation. Feed magazine built for tapping lathe. Knife sharpener removes templet burrs. Air valve ejects parts from drill jig. Guide light on shears speeds production. Form cutter made with inserted teeth. Press jig spaces holes in angle iron. Roller bearing replaces bronze arbor bushing.

20-179. **Westinghouse Machine Tool Forum Attracts Biggest Attendance.** *Iron Age,* v. 153, May 11, '44, pp. 78-81.

Electronic tracer mechanism, electrical shortcomings, to buy or build, electrical standards, mechanical data, carbide steel milling, future of industry.

20-180. **Signs and Portents of New Era for Machine Tools.** Guy Hubbard. *Steel,* v. 114, May 15, '44, pp. 92, 94.

Need for further standardization of machine tools; need for speeds and feeds; electric control; present emergency finish on machine tools; standard color used on machine tools; accuracy and work finish; chip disposal; lubricating facilities on machine tools; and electric control.

20-181. **Faces Motor Base With Flycutter.** *Steel,* v. 114, May 15, '44, p. 96.

Electrical manufacturer reverses cardinal rule of machine shop practice, adapting flycutter attachment which takes tool to the work. Setup simplifies production, utilizes break-in run of motor for power to drive tool.

20-182. **How to Use Roller Turner Tools.** R. D. Mack. *Western Metals,* v. 2, May '44, pp. 40, 42-43.

Setting of tool and roll, speeds and feeds for cutting steel, tool shape, chip breakers, grinding sequence.

20-183. **How to Secure Fine Surfaces by Grinding.** H. J. Wills and H. J. Ingram. *Machinery,* v. 50, May '44, pp. 181-182.

Lapping operations in the tool room.

20-184. **Cutting Fluids for Machining Operations.** *Machinery,* v. 50, May '44, pp. 187-189.

Functions and classes of cutting fluids and their application in machining different materials.

20-185. **Spindle Nose Ground After Assembly.** *American Machinist,* v. 88, May 25, '44, p. 111.

In order to make certain that spindle noses on its line of engine lathes run true, the Axelson Manufacturing Co. has devised a fixture through the use of which the surfaces on this member may be ground after the spindle has been assembled with the headstock.

20-186. **Practical Ideas.** *American Machinist,* v. 88, May 25, '44, pp. 115-120.

Reduces tool breakage when machine tapping holes. Camshaft keys fitted in a jig. Aluminum pins fasten laminated dies. Drill chuck used as punch holder. Magnetic clamp holds subassemblies for welding. Fillet turned without undercutting warped pipe. Anvil speeds hardness testing of tubes. Improves design of seam-welder mandrel. Large micrometer equipped with signal light. Machine reamer fed by gravity. Plug gages made from drill rod. Adjustable plug aligns bushing.

20-187. **Step up Milling Efficiency by Using Fewer Cutter Teeth.** Arthur A. Schwartz. *American Machinist,* v. 88, May 25, '44, pp. 112-113.

Take a heavier chip and cut faster so that the heat generated will be concentrated in the chips and got rid of before it has the chance to damage the tool or work.

20-188. **Hyper Milling vs. Fly Cutter Milling.** Gaylord G. Thompson. *Iron Age,* v. 153, May 18, '44, pp. 60-65.

Advantages of single-point fly cutter milling over multi-tooth face mills with negative rake angles are

the lower power requirements, reduced cost and ease in maintenance. A cutter body is described in which the fly cutter can be mounted in one of several slots at various negative helix or axial rake angles to suit the particular operating condition.

20-189. **Hand Drilling Operations Speeded Up.** Robert A. Trumpis and H. Honsberger. *Iron Age,* v. 153, May 18, '44, pp. 72-73.

Using a self-centering drill attachment and beveled guide holes in a panel jig has reduced drill breakage 50%, reduced time of drilling and improved quality in aircraft fuselage manufacture.

20-190. **Slinging Turret Lathes and Automatics.** *Machinery* (London), v. 64, April 6, '44, pp. 377-379.

Method of slinging the Herbert No. 9B combination turret lathe.

20-191. **Choosing the Right Material.** H. W. Gillett. *Machine Design,* v. 16, May '44, pp. 111-114, 164, 166, 168, 170, 172, 174.

Part VI—Ability to be processed. Machinability; crumbly chips aid machining; formability; tests become complex; weldability; characteristics affecting heat treating; processing by alternative methods; cold forming accentuates directional properties; castings reduce machining costs. 13 ref.

20-192. **Drilling Aircraft Channels.** *Aircraft Production,* v. 6, May '44, p. 229.

Novel application of portable pneumatic drills.

20-193. **Radius Broaching of Turbine Buckets.** *Iron Age,* v. 153, May 25, '44, pp. 59, 132.

Turbine buckets are press-fitted to the wheel combination dovetail and tongue and groove mounting. The anchorage groove of bucket sections must be machined with high precision so that there will be full contact of the interlocking groove and tongue to assure rigidity in assembly.

20-194. **Predicting Machine Productivity for Future Applications.** G. B. Carson and L. C. Cole. *Mechanical Engineering,* v. 66, June '44, pp. 384-388.

Before a machine can reflect well-rounded design, it must show the results of a systematic and thorough correlation of (1) motion study; (2) machine design; (3) tool design; (4) search (experimental); (5) industrial design.

20-195. **Carbide Toolbits Give Good Results in Precision Boring.** Russ Hitz. *American Machinist,* v. 88, June 8, '44, pp. 96-97.

Speed and feed chart for precision boring machines.

20-196. **Special Taps Are Often a Requisite of High-Speed Precision Tapping.** Herman Goldberg. *American Machinist,* v. 88, June 8, '44, pp. 98-101.

Standard taps are not always suitable for precision tapping. Why and how taps function and reasons for special considerations.

20-197. **Don't Overlook Automatic Lathes for Turning Parts in Small Lots.** Bengt Branberg. *American Machinist,* v. 88, June '44, pp. 105-107.

Time-saving advantages of automatic lathes can be utilized by exercising care in applying the tools required, arranging cycles and organizing production.

20-198. **Practical Ideas.** *American Machinist,* v. 88, June 8, '44, pp. 108-112.

Square locating pin prevents damaged bushings. Drilling clean holes in thin sheet metal. Fixture for grinding circular form tools. Rods slotted with saw jig. Collapsible chuck key saves machine time. Cut-out squeezer fitted with stop gage. Shaft fitted with driving and locking keys. Portable motor has adjustable countersink. Retractable toolbit used for back chamfering.

20-199. **Machining the Barrel for the Light Carbine.** Frank J. Oliver. *Iron Age*, v. 153, May 25, '44, pp. 46-53.

Increasing the speed and power of standard machine tools and using carbide tipped tools has resulted in considerable increase in output. Use of carbide drills with high pressure coolant and coarse tooth reamers has helped speed up bore machining, together with broach rifling and automatic chambering operations.

20-200. **Production Milling.** *Automobile Engineer*, v. 34, April '44, pp. 137-144.

Servo-hydromatic millers for profile milling and rise and fall millers. Typical production applications also described. Details are given of various jobs carried out on plain hydromatic, servo-hydromatic and hydrotel milling machines.

20-201. **Contour Machining.** *Automobile Engineer,* v. 34, April '44, pp. 153-155.

Automatic sizing units designed for use in conjunction with Monarch engine or tool-room lathes. When a unit is fitted, the machine can be used either as an automatic lathe for step-shaft turning, step boring, step facing or any combination of step, taper and contour turning, boring or facing, or as a conventional engine lathe. Methods of setting up are discussed, brief descriptions are given of the various automatic cycles that can be employed and production data are included for two typical shaft turning jobs.

20-202. **Grinding Lead Screws Accurate to 0.0002 In. in 16 In.** J. R. Moore. *Iron Age,* v. 153, June 1, '44, pp. 42-46.

This article describes the elaborate techniques worked out over a period of years to achieve the ultimate in accuracy in the manufacture of micrometer screws for a small jig borer. Highlight of the method is the use of an electronic thermostat to maintain the temperature of the coolant and hence the work at a constant differential with respect to the master lead screw of the thread grinder.

20-203. **Machining Aircraft Parts.** G. Eldridge Stedman. *Steel,* v. 114, June 5, '44, pp. 102-103, 158, 160, 162.

Unusual problems which were solved in a unique manner by North American Aviation's Kansas City Plant.

20-204. **Machining Methods for Extreme Precision.** *Die Casting,* v. 2, June '44, pp. 45-50.

In some cases the intricacy of die casting leads to special machining problems. To retain the advantage of their use this manufacturer has developed several interesting machining set-ups and operations for die castings.

20-205. **Some Grinding Methods Used in Aircraft Production.** *Machinery* (London), v. 64, April 13, '44, pp. 406-409.

A series of illustrations showing how many problems in the manufacture of aircraft parts have been solved.

20-206. **The Production of the 5.5-Inch Howitzer.** *Machinery* (London), v. 64, April 20, '44, pp. 421-427.

Machining methods for the main parts.

20-207. **Interesting Operations in a Douglas Aircraft Machine Shop.** *Machinery* (London), v. 64, April 20, '44, pp. 431-436.

Fly-cutting with tungsten and tantalum carbide tool bits is coming increasingly into vogue. The fine finish and accuracy obtained with cutters of this type in machining aluminum has led to their fairly extensive adoption in finishing steel parts. This practice brings important economies in milling and grinding time, in addition to the advantages of high quality work.

20-208. **Controlling Machinability of Screw Machine Stock.** S. B. Knutson. *Iron Age,* v. 153, June 8, '44, pp. 62-65.

Experience with large tonnages of cold drawn alloy bar stock received from practically all major sources in the past two years has led to certain definite conclusions as to the metallurgical aspects of machinability of small caliber armor piercing bullet cores. Depending upon the stock diameter, definite limits have been set on the fineness of a spheroidized annealed structure and related tensile strengths. A new concept of "ridigity" has been set up.

20-209. **Grinding Lead Screws Accurate to 0.0002 In. in 16 In.** J. R. Moore. *Iron Age,* v. 153, June 8, '44, pp. 66-70.

Special equipment devised for checking tooth form and lead accuracy of precision screws. Use of a lead screw as a measuring device depends upon proper alignment with the nut and the several methods of achieving this are discussed, together with the factors involved.

20-210. **Automatic Sheet Layout Slashes Production Time.** Arthur Glade. *Tool Engineer,* v. 13, June '44, pp. 91-93.

Without tedious layout work in the shop, complicated sheet metal parts are produced accurately and swiftly through use of a semi-automatic layout mechanism applied to a standard indexing punch press.

20-211. **Mass Manufacturing for Interchangeability.** *Tool Engineer,* v. 13, June '44, pp. 76-84.

Production machining and assembly of gun mechanism, tooling for machining armor plate tank parts, machining on "in-line" production of aircraft parts.

20-212. **Carbide-Tipped Lathe Centers Reduce Rejects.** Delmer Rhino. *Tool Engineer,* v. 13, June '44, p. 94.

Proper application permits taking full advantage of longer life and closer tolerances in finish grinding and turning operations.

20-213. **Carbide Milling of Steel.** H. A. Frommelt. *Steel,* v. 114, June 12, '44, pp. 100, 102, 104.

Multitooth carbide-tipped cutters have attained a state of development which insures their beneficial use in peacetime for carbide milling of steel.

20-214. **Tool Control System.** *Steel,* v. 114, June 12, '44, p. 112.

Saves on grinding and handling, improves plant operating efficiency by reducing scrap and deviations, raises quality of finished product.

20-215. **Inserted-Tooth Milling Cutters.** *Engineering,* v. 157, April 28, '44, pp. 327-328.

The cutter is of the cup type with teeth set in the rim. The body of the cutter is of carbon steel and the teeth are of "Osbornite" sintered carbide brazed in place. The name given to the tool is the "Negraika" super-facing cutter, the name implying that the teeth are formed and set so as to give negative angles on the helix and face. It is stated that very high cutting speeds are obtainable with the cutter.

20-216. **Fundamentals in Milling Practice.** H. A. Frommelt. *Machine Tool Blue Book,* v. 40, June '44, pp. 143-144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176.

Three vital essentials include a good workpiece setup, proper choice and assembly of cutters, and correct operation of the machine.

20-217. **Special Grinder Applications.** John E. Hyler. *Machine Tool Blue Book,* v. 40, June '44, pp. 199-200, 202, 204, 206.

Remarkable increase in overall efficiency and versatility of machine shops, by use of portable grinding attachments.

20-218. **Recent Developments in Permanent Magnetic Chucks.** Charles D. Briggs, *Machine Tool Blue Book,* v. 40, June '44, pp. 263-264.

Finished magnetic device can be broken down into three components: 1—The magnetic "battery"; 2—The utilization of this force; 3—The adaptability of this force.

20-219. **Machining Steels on Automatics with Carbide Tools.** Carl W. Blade. *Machine Tool Blue Book,* v. 40, June '44, pp. 269-270, 274.

In applying carbide tipped tools to automatic screw machine operations on various grades of carbon and alloy steels, excellent results as to increased production, lowered machining costs and tool life can be obtained by adhering to certain basic rules.

20-220. **Machinability of Plain Carbon, Alloy and Austenitic (Non-Magnetic) Steels and Its Relation to Yield Stress Ratios When Tensile Strengths Are Similar.** E. J. Janitzky. American Society of Mechanical Engineers, Paper No. 44-SA 10, June '44.

Development of an index of machinability for rough turning. Relation between Taylor speed and yield stress ratios of the same tensile strength has been expressed mathematically and graphically.

20-221. **Machining Parts for the 5.5-Inch Howitzer.** *Machinery* (London), v. 64, April 27, '44, pp. 449-454.

Some of the principal machining operations on the saddle, the training base, and other main components of the gun. The saddle and training base are both fabricated from steel plate by welding.

20-222. **Operations in the Production of Marauder Bombers.** *Machinery* (London), v. 64, April 27, '44, pp. 457-460.

Development of special jigs for use on Erco punching and riveting machines.

20-223. **Machining Magnesium Alloys.** L. B. Whitburn. *Light Metals,* v. 7, May '44, p. 217.

Do's and don't's in cutting operations on the ultra-light alloys. General uses of these materials in the post-war world should profit by lessons learned from experience in aircraft construction during the war.

20-224. **Understanding of Cutter Elements Will Aid in Selection and Sharpening.** M. Martellotti. *American Machinist,* v. 88, Dec. 21, '44, pp. 102-104.

Milling cutter elements must conform to certain requirements, found necessary to increase the efficiency of the cutter, provide longer cutter life, improve cutter perforance and produce a superior quality of finish on the milled surface. Selection of body, periphery, diameter, sides and width, face and back, tooth angle, cutting edge. Helix or "spiral" angle; contact varies with angle.

20-225. **Negative Rake and Carbides.** Arthur A. Schwartz. *Tool & Die Journal,* v. 10, June '44, pp. 83-86, 103.

Negative rake is only an expedient used to compensate for the one weak characteristic of all carbides, i.e., brittleness or lack of elongation.

20-226. **Modern Designs for Drilling Jigs and Tapping Fixtures.** *Tool & Die Journal,* v. 10, June '44, pp. 94-97.

Four common classes of thread fits which are in everyday use.

20-227. **Drill Block Locates Holes in Jig Clips.** *American Machinist,* v. 88, June 22, '44, p. 95.

Any inaccuracies will be shown by deviations in the indicator needle as each clip is tested.

20-228. **Many Factors Besides Taps Affect High-Speed Precision Tapping.** Herman Goldberg. *American Machinist,* v. 88, June 22, '44, pp. 98-101.

Each tapping operation should be studied as to material cut, percentage of thread, tolerances, lubricants and machine ranges to produce satisfactory work.

20-229. **How Can Machine Tools Be Improved?** H. T. Johnson. *American Machinist,* v. 88, June 22, '44, pp. 105-106.

Ten questions and answers on machine-tool design.

20-230. **Practical Ideas.** *American Machinist,* v. 88, June 22, '44, pp. 107-112.

Clamp exerts 20 tons pressure. Micrometer head added to a planer gage. Microscope locates layout points on rough castings. Drilling fixture has equalizing stop. Short shells cut from large tubing. Extractor pulls hat-sections from die channels. Prevents scratching of sheared aluminum sheet. Drill jig fitted with screw jack. Taper plug gages checked with sine bar. Stud puller for close quarters. Retooling saves 6240 man-hours.

20-231. **Some Grinding Methods Used in Aircraft Production.** *Machinery* (London), v. 64, April 13, '44, pp. 406-409.

The ingenious arrangements shown have solved many of the problems in the manufacture of aircraft parts.

20-232. **Carbide Milling of Steel.** H. A. Frommelt. *Iron Age,* v. 153, June 22, '44, pp. 52-57.

Phenomenal gains in output and cutter life by the use of negative angle carbide milling cutters over high speed steel cutters. Test data in chart form demonstrating the relation of lead or bevel angle and the number of pieces obtained per grind, and the relationship between spindle horsepower and depth of cut, feed rate and width of cut. Cutter life tests are summarized.

20-233. **Grinding High Speed Steel Tools.** N. A. Malone. *Steel,* v. 115, July 10, '44, pp. 96, 98, 114.

Selection of the proper grade of grinding wheel as to type of abrasive and bond for a specific job is highly important. Care is required to prevent glazing the surface of the abrasive grains. Emphasis is laid on tool standardization as well as the staff manning the tool supply department.

20-234. **Negative-Rake Milling.** *Machinery* (London), v. 64, May 18, '44, pp. 533-543.

A revolutionary development in shop practice.

20-235. **Are Your Machines Overloaded?** Gerald Eldridge Stedman. *Tool Engineer,* v. 14, July '44, pp. 70-72.

Knoxville machinery manufacturer designs jigs to put shaper jobs on milling machine or boring mill. Other setups increase production from 50 to 400% on shapers, planers and radial drills.

20-236. **Tooling to Increase Production Efficiency.** *Tool Engineer,* v. 14, July '44, pp. 74-81.

Improved machining setups, forming for high production, two classes of assembly tooling.

20-237. **Design and Use of British Magnetic Chucks.** *Tool Engineer,* v. 14, July '44, pp. 82-84.

Magnetism and grip, features of various chucks, a special development, performance of other chucks, clamps not required.

20-238. **Machining Magnesium.** A. M. Lennie. *Tool Engineer,* v. 14, July '44, pp. 85-88.

Ease and economy of machining magnesium frequently make it the cheapest structural material. Quality finish and production savings may be achieved

through utilization of recommended machining practice.

20-239. **Rapid Indexing Fixture.**. S. Smith. *Machinery* (London), v. 64, June 8, '44, p. 621.

Fixture illustrated, applied to a horizontal milling machine, was designed for rapidly milling the oil slots in transfer tubes.

20-240. **Power Required in Milling with Negative-Rake Cutters.** H. Ernst. *Machinery* (London), v. 64, June 8, '44, pp. 623-625.

Stronger tooth form obtained with the negative rake angle is a definite advantage and more than offset by a less effective cutting action. Power required to remove metal increases greatly as the conventional positive rake angle is decreased.

20-241. **The Art of Counterboring.** H. F. Williams. *Machine Tool Blue Book,* v. 40, July '44, pp. 133-134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156.

Suggestions are given which will indicate when to counterbore for a saving of time, effort and cost.

20-242. **Carbide Milling of Steel.** H. A. Frommelt. *Machine Tool Blue Book,* v. 40, July '44, pp. 161-162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188-190.

History, characteristics, typical illustrations.

20-243. **Momentum in Carbide Milling of Steel.** E. O. Lowell. *Machine Tool Blue Book,* v. 40, July '44, pp. 199-200, 202.

Increase in momentum can be obtained through an increase of either mass or motion. Large mass of gear train in relation to the size of the milling cutter produces the momentum necessary for longer cutter life.

20-244. **Production Milling.** *Machine Tool Blue Book,* v. 40, July '44, pp. 219-220, 222, 224.

The present trend is away from special equipment, composed of a standard machine to which has been added a specially designed or engineered fixture or attachment. The present trend indicates the acceptance and use of equipment specially engineered throughout.

20-245. **Recommendations on the Use of Diamond Tools.** Paul Grodzinski. *Machine Tool Blue Book,* v. 40, July '44, pp. 255-256, 258, 260, 262.

The diamond is set rigidly into a steel holder or shank. The special method is to have only one cutting edge in operation at a time. Thus geometrically correct surfaces are produced.

20-246. **Cutting Tool Nomenclature.** J. Rennie. *Machinery* (London), v. 64, June 15, '44, pp. 655-657.

Definitions, tool setting, types of tools.

20-247. **Speeds and Feeds for Milling Operations.** S. C. B. *Machinery* (London), v. 64, June 15, '44, pp. 660-663.

Method used to determine speeds and feeds, table feeds, feed and chip thickness, first step in determining speeds and feeds, power feeds and maximum chip thickness.

20-248. **Determining Tool Forces in High-Speed Milling by Thermoanalysis.** A. O. Schmidt. *Mechanical Engineering,* v. 66, July '44, pp. 439-442.

Relation between cutting speeds, feeds, tool angles, and workpiece material. Test procedures and sample computations of derived data are included.

20-249. **High Production Machining of Magneto Parts.** H. M. Fraser. *Die Casting,* v. 2, July '44, pp. 57-62.

To get the full advantages of die castings, designs should consider final machining factors. Comprehensive study of suggested tooling and set-ups for a variety of zinc, aluminum and brass parts.

20-250. **Developments in Precision Tapping and Correct Tap Nomenclature.** R. R. Williams. *Tool & Die Journal,* v. 10, July '44, pp. 96-97, 104.

Why to expect a tap to cut larger than its own pitch diameter.

20-251. **Knowledge of a Tap's Action Extends Its Maximum Usefulness.** Herman Goldberg. *American Machinist,* v. 88, July 6, '44, pp. 104-107.

Proper choice of taps, care in sharpening practice and use of correct cutting oils to avoid overloading will contribute to marked savings in tool costs.

20-252. **Set-Ups for Increasing Production with Formed or Multiple Wheels.** A. Lambert Oller. *American Machinist,* v. 88, July 6, '44, pp. 108-110.

It pays to study any plunge-cut grinding operation to see whether it can be done quicker with a formed wheel, or by mounting several wheels on the spindle. Very often seeming bottlenecks in production are easily solved by one of the setups illustrated.

20-253. **Practical Ideas.** *American Machinist,* v. 88, July 6, '44, pp. 111-116.

Magnetic frame supports drill motor. Turning a sphere on a milling machine. Spring tool cuts chambered hole. Chucking small pieces on a B. & S. grinder. Lathe stops arranged to turn shoulder. Laying out holes to close tolerances. Short nipples threaded in collet chuck. Fixture speeds sawing of masonite. Rough and semifinish facing in one operation. Jig locates angle iron for drilling.

20-254. **Controlled Lubrication Program Curtails Failure in Machine Tools.** Frank A. Sylvester. *American Machinist,* v. 88, July 6, '44, pp. 117-121.

Allis-Chalmers uses color code to assure servicing of machines with proper oils. Cards marked at individual machines after servicing provide daily records.

20-255. **Tooling Dock Technique Saves Time, Speeds Accuracy.** Leland A. Bryant. *Aviation,* v. 43, July '44, pp. 152-154, 263.

Convair finds automatic elimination of errors and increased tool production are direct results of adoption of this principle of assembly and checking of jigs and fixtures.

20-256. **Hole Piercing Proves Faster—and Cheaper. I.** Herbert Chase. *Aviation,* v. 43, July '44, pp. 161-163, 262.

Obviating use of drills, Martin system combines with conveyor belt line to simplify and boost production of small assemblies.

20-257. **Toolbits of 30° Radial Rake Speed Machining of Magnesium.** Paul Thut. *American Machinist,* v. 88, July 20, '44, pp. 91-95.

Thin-section Mg alloy die castings are machined at cutting speeds as high as 15,000 surface ft. per min. Two toolbits are used on the majority of cutters.

20-258. **Lightweight, Simple Fixtures Pave Way for High-Speed Tapping.** Herman Goldberg. *American Machinist,* v. 88, July 20, '44, pp. 98-101.

Since loading often takes more time than actual tapping, care must be taken to design fixtures for fast loading, as well as to hold and support pieces properly.

20-259. **Bushings Threaded Four Times Faster With Carbide-Tipped Tools.** C. O. Averill. *American Machinist,* v. 88 July 20, '44, pp. 102-104.

By means of interchangeable tool-blocks fitted with two preset tungsten carbide toolbits, production increased with respect to machining the external thread on aircraft spark plug bushings.

20-260. **Special Indexing Device Hastens Milling of Multi-Surface Slots.** I. F. Huey and W. L. Doney. *American Machinist* v. 88, July 20, '44, pp. 106-107.

Dovetail slots, formerly milled with special form cutters, are cut four at a time with plain milling cutters operating in gangs of eight and two set-ups.

20-261. **Machine Lubrication May Follow Automotive Service Methods.** F. L. Schafenacher. *American Machinist,* v. 88, July 20, '44, pp. 108-109.

Lubrication program to minimize machine breakdowns.

20-262. **Practical Ideas.** *American Machinist,* v. 88, July 20, '44, pp. 113-118.

Gage checks diameter of bellmouthed dies. Layout table simplifies cutting of Al sheet. Surface gage fitted with micrometer. Chain and sprocket drives for tumbling barrels. One die shoe for several sizes of dies. Emergency milling on a lathe. Boring bar holding arm. Machining cams on a drill press. Radius forming tool cuts concave and convex surfaces. Lathe attachment for pipe threading machine. Equalizing fixture for threading forked rods. Controlling accuracy of formed stampings.

20-263. **Milling Douglas Integral-Eye Spar Caps From Rolled Billets.** N. A. Lombard and G. R. Gwynne. *Machinery,* v. 50, July '44, pp. 164-175.

Manufacturing technique established for producing two spar caps of unique design from one aluminum billet 30 ft. in length.

20-264. **Grinding to Ten-Thousandths Inch on a High Production Basis.** Ralph Price. *Machinery,* v. 50, July '44, pp. 201-204.

Methods and equipment used for high production grinding of work that is held to size within 0.0001 in.

20-265. **How to Secure Fine Surfaces by Grinding.** H. J. Wills and H. J. Ingram. *Machinery,* v. 50, July '44, pp. 208-209.

Lapping operations as applied to the production of gears and worms.

20-266. **Cushioning of Tipped Turning Tools.** Clarence E. Buote and Robert Holden. *Iron Age,* v. 154, July 20, '44, pp. 70-72.

Extensive tests conducted in machining 75-mm. A. P. shot indicate that "cushioned" carbide tools with a copper shim under the tip have almost doubled the life between grinds over standard tipped tools. Using a cushioned braze on tipped high speed steel dovetail form tools has eliminated breakage completely. In general it has been found that copper cushions ranging between 1/64 and 1/32 in. in thickness gave better results than greater or lesser cushions.

20-267. **Hyper-Milling.** *Automobile Engineer,* v. 34, June '44, pp. 223-229.

Results obtained in a number of production operations and details of feeds, speeds and cutters described. Recommendations given concerning machines, fixtures, and operating precautions.

20-268. **Gear Shaving.** *Automobile Engineer,* v. 34, June '44, pp. 233-236.

Discussion of American methods and typical machines.

20-269. **Applications of Negative-rake Milling.** *Machinery* (London), v. 64, May 25, '44, pp. 561-564.

Typical negative-rake milling operations, emphasizing their value in increasing production.

20-270. **Air-Operated Jigs and Fixtures.** L. H. Leedham. *Machinery* (London), v. 64, June 1, '44, pp. 601-604.

Description of two highly successful designs; the drilling and reaming fixture; fixture for the milling operation.

20-271. **High Speed Milling Operations Improved by Reducing Number of Cutting Teeth.** Fred W. Lucht. *Western Metals,* v. 2, July '44, pp. 34, 36.

Maintaining sufficient feed per tooth is important in steel cutting—particularly in roughing—to provide both sufficient tooth loading and adequate load distribution back of the cutting edge.

20-272. **Drill Fixture for Structural Angles.** *Iron Age,* v. 154, July 27, '44, p. 51.

Drill fixture for locating holes in structural angles up to 10 ft. in length. T-bar holding assembly equipped with scales and indicators for quick and accurate indexing in both coordinate directions.

20-273. **Redesigning to Improve Speed and Accuracy.** E. D. Beachler. *Machine Design,* v. 16, August '44, pp. 133-138.

Crankpin turning lathe achieves high production and precise operation with highly automatic controls and novel design features.

20-274. **Effect of Structure and Composition on the Machinability of Copper Alloys.** D. K. Crampton. *Metal Progress,* v. 46, August '44, pp. 275-284.

How machinability is related to nature of dispersed phase, the composition of the alloy in major constitu-

ents, the previous cold work (the temper draw), and the nature of the cutting operation.

20-275. **Yale & Towne Sets Up Ingenious Machining Department for Locks.** *Die Casting,* v. 2, August '44, pp. 44-46, 50-53.

A seven-station Kingsbury machine set up for substantially complete machining of a padlock body.

20-276. **Tools, Jigs and Fixtures at North American Aviation.** Gerald Eldridge Stedman. *Machine Tool Blue Book,* v. 40, August '44, pp. 129-130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152.

N.A.A. original designs in machine tools, jigs, and fixtures.

20-277. **Fundamentals in Milling Practice.** H. A. Frommelt. *Machine Tool Blue Book,* v. 40, August '44, pp. 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 184, 186.

Good work piece setups, proper choice and assembly of cutters and correct operation of the machine.

20-278. **Electronic Drilling Control.** P. D. Aird. *Machine Tool Blue Book,* v. 40, August '44, pp. 199-200, 202, 204, 206.

Utilization of the increase in the torque load in the drill spindle as activating agent in automatically withdrawing drill point from the work.

20-279. **Low Cost Tools Without Elaborate Drawings.** W. J. Curry. *Machine Tool Blue Book,* v. 40, August '44, pp. 252, 254, 256.

Adequate tools can be obtained in shorter time at much lower cost by assigning the jobs to ingenious mechanics who will design, develop, and test the tools without drawings, and frequently with very little machining. Illustrations show low cost tools designed and built by Michael Reichlin, at General Electric's Lynn River Works.

20-280. **Mattison Precision Vertical-Spindle Way Grinder.** *Machine Tool Blue Book,* v. 40, August '44, p. 294.

A new type grinder for finishing tables, slides, saddles, heads, turrets and other parts, having angular machined ways or surfaces.

20-281. **Machining Tool Steels at High Speeds.** A. W. West. *Tool Engineer,* v. 14, August '44, pp. 67-70.

Manufacture of gripper dies for hot forging is speeded by high speed milling with carbides. Radius grinding fixture produces negative rake cutters to mill grooves.

20-282. **Product Re-Design Introduces New Methods.** *Tool Engineer,* v. 14, August '44, pp. 74-80.

Mass manufacture of D. C. motor of same size as A. C. unit of comparable power, imposed problems in machining parts to higher accuracy and assembling them in smaller space.

20-283. **Oil Field Shops Demand Top Tooling.** Gerald E. Stedman. *Tool Engineer,* v. 14, August '44, pp. 81-83.

Producing machines and tools which lowered drilling costs.

20-284. **Manufacturing Small Parts to High Accuracy.** John E. Hyler. *Tool Engineer,* v. 14, August '44, pp. 86-90.

Swiss-type automatics, built in America, produce tiny parts 0.015 to ½ in O.D. Intricate contours, recesses and undercuts can be machined in a single operation. Form tools are not usually required.

20-285. **Machining Magnesium.** A. M. Lennie. *Tool Engineer,* v. 14, August '44, pp. 91-94.

Recommended methods for ten machining operations.

20-286. **Heavy Surface Grinding for Precision.** *Tool Engineer,* v. 14, August '44, p. 99.

Heavy-duty machines eliminate hand-scraping and save as much as 75% of production time.

20-287. **Production of Chaser Blocks for the Namco Diehead.** *Machinery* (London), v. 65, July 6, '44, pp. 1-6.

List of the operations in the production of the chaser block.

20-288. **Care and Use of Thread-Cutting Dies.** M. B. H. *Machinery* (London), v. 65, July 6, '44, pp. 9-12.

Recommended practice in the maintenance and application of thread-cutting dies having tangential type chasers.

20-289. **Use of "Cushions" Adds to the Life of Tipped Tools.** Leo J. St. Clair. *American Machinist,* v. 88, August 3, '44, pp. 83-85.

Thin copper "cushion" between the tool shank and tip has been credited with increasing tool life as much as five times and permits use of high-cobalt tips.

20-290. **Combination Tooling Eliminates Second Operation on Small Parts.** A. Ainsworth. *American Machinist,* v. 88, August 3, '44, pp. 86-88.

Results and advantages gained through combination tooling on automatic screw machines. Each example is a different design principle.

20-291. **Cast Chuck Centers Bevel Gear.** *American Machinist,* v. 88, August 3, '44, p. 89.

Aircraft gear held by the teeth in a quickly made Kirksite chuck while grinding operations are done on shank.

20-292. **Machining Tolerances Held in Producing Small Stamped Parts.** *American Machinist,* v. 88, August 3, '44, pp. 90-93.

Fine finishes and tolerances to 0.0005 in. are being attained on war products where stampings are used to replace forgings and castings formerly required.

20-293. **Subtractive Lead Method Used to Hob Gears with Small Helix Angles.** J. W. Bergman. *American Machinist,* v. 88, August 3, '44, pp. 97-98.

Helix angles, small as 0.001 in. per inch of face width, can be formed by using lead and non-differential gearing combinations.

20-294. **Economical Tapping Results from Use of Chute and Indexing Fixtures.** Herman Goldberg. *American Machinist,* v. 88, August 3, '44, pp. 102-104.

Precision tapping at a rate of 2000 to 3800 pieces an hr. Examples and variations of both shown.

20-295. **Practical Ideas.** *American Machinist,* v. 88, August 3, '44, pp. 105-110.

Air-operated table for hand miller. Gage indicates faults of tapers. Modernizing dial indicator stands. Gage life extended by adding dial indicator. Lathe attachment for turning spherical surfaces. Special toolblock reduces cutting time. Improvised winding machines. Drawing lines parallel to a splined line. Boring and tapping fixture for engine lathe. Two simple carbide tools replace form tool. Simple arrangement removes chips from taps.

20-296. **Jump-Turning Operations Increase Production of 155-mm. Howitzers.** Sanford Wixson. *American Machinist,* v. 88, August 3, '44, pp. 111-115.

Segmental threads an unusual job; inspected on the machine; left-hand nut for safety; shaper operation shortened.

20-297. **Standard Equipment Adapted to Produce Recoil Mechanisms.** G. Walter Ostrand. *American Machinist,* v. 88, August 3, '44, pp. 116-120.

In conversion to armament production, Link-Belt developed set-ups that eliminated need for new and special machines, saving time and expense.

20-298. **Working to "Tenths" on the Sperry Aircraft Gyropilot.** George A. Richroath. *Machinery,* v. 50, August, '44, pp. 152-161.

Exacting methods of machining, assembly, and inspection are employed by Sperry in building the Gyropilots used in combat planes. Fine instrument making on a large-scale production basis.

20-299. **Grinding Fluids Deserve Careful Study.** W. H. Oldacre. *Machinery,* v. 50, August '44, pp. 185-186.

Review of grinding fluids; chip formation in grinding.

20-300. **Design of Tools and Fixtures.** *Machinery,* v. 50, August '44, pp. 187-189.

Die for cutting matching notches in two side frames simultaneously; contour follower gage for inspecting irregular profiles; facing attachment designed with automatic feed; high-speed milling results.

20-301. **Air-Operated "Razors" for Rivet Heads.** *Compressed Air Magazine,* v. 49, August '44, p. 212.

Portable air-driven milling tool that supplements the pneumatic riveting hammer.

20-302. **Cutting-Tool Performance.** Axel E. Lundbye. *Mechanical Engineering,* v. 66, August '44, pp. 536-538, 542.

Increasing tool life and life of machine parts by combination of chromium plating and after-treatment by Lundbye process.

20-303. **Gun Barrels Machined from Reduced Forgings.** Frank J. Oliver. *Iron Age,* v. 154, August 10, '44, pp. 46-49.

By demanding forgings finished more closely to size, Springfield Armory has saved a tremendous amount

of material in manufacturing barrels for the M-1 cal. 0.30 Garand rifle. Revision of the initial machining operations has resulted in use of 22 less machine tools and correspondingly fewer operators.

20-304. **Sensational Increase in Milling Speed.** J. H. Grayson. *Steel,* v. 115, August 14, '44, pp. 92-93, 142.

Attained with standard machine equipped with carbide cutters—provided utmost rigidity is engineered into the setup and a "momentum wheel" is used.

20-305. **Production of the Allison Liquid-Cooled Aero-engine.** *Machinery* (London), v. 65, July 20, '44, pp. 57-62.

Automatic machines developed to eliminate hand-lapping previously necessary on cylinder-head assemblies and cylinder-head covers.

20-306. **Punching on the Centre Line of Strip of Varying Width.** *Machinery* (London), v. 65, July 20, '44, p. 63.

Stock guides with automatic adjustment.

20-307. **Milling Cutters and How to Use Them.** M. Martellotti. *American Machinist,* v. 88, August 17, '44, pp. 91-95.

Use of cutter materials governed by known characteristics.

20-308. **Users Agree on Proposed Machine Tool Improvements.** *American Machinist,* v. 88, August 17, '44, pp. 99-100.

Questions and answers by H. T. Johnson of General Motors.

20-309. **Three - Dimensional Surface Plate Cuts Labor Costs 40 Percent.** Earl M. Barden. *American Machinist,* v. 88, August 17, '44, pp. 102-104.

The universal setting fixture helps in positioning locators accurately and economically on large aircraft pipe fixtures replacing the costlier methods requiring a level or transit.

20-310. **Index Reaming Fixture for Precision Work.** Henry Bernadt. *American Machinist,* v. 88, August 17, '44, p. 105.

A triangular positioning piece which rotates in a vertical plane on a pivot attached at right angles to a base and standard. Indexing is accomplished by an arm which rotates about the same axis as the positioning piece.

20-311. **Good Tooling for Difficult Screw Machine Jobs.** *American Machinist,* v. 88, August 17, '44, pp. 106-107.

Parts produced with little or no scrap by attention to tooling, gaging and handling.

20-312. **How One Machine Tool Builder Produces Direct War Goods.** C. K. Swafford. *American Machinist,* v. 88, August 17, '44, pp. 108-111.

New production processes and special set-ups for turning out various parts for Naval materiel under subcontracts.

20-313. **Practical Ideas.** *American Machinist,* v. 88, August 17, '44, pp. 115-120.

Machining a ball bearing fit in blind holes. Auto-

matic power cut-off to prevent tool breakage. Block method for measuring tapers. Automatic feed and ejector for power punch. Improved trammel points. Lathe jack for large shafts. Safety device for lathe leadscrews. Rack for grinding wheels. Lifting and rolling device for a plate bending press. Worn-out chaser dies converted into finished tools.

20-314. **Tool Room Surface Grinding.** J. E. Corbett. *Tool and Die Journal*, v. 10, August '44, pp. 89-92.

Purpose of this article was to establish rule: The warmed side of a piece of stock (originally flat, parallel and of uniform temperature) will become convex and cause the piece to bow. If, in this condition, the warm side is then ground flat, it will become depressed or concave as the temperature throughout the piece again becomes uniform.

20-315. **Modern Designs for Drilling Jigs and Tapping Fixtures.** *Tool and Die Journal*, v. 10, August '44, pp. 98-102.

High speed precision tapping, rear sight assemblies, base and bolt handle base for rifles, high speed horizontal tapping machine, vertical tapping machine.

20-316. **Hole Piercing Proves Faster—and Cheaper.** Herbert Chase. *Aviation*, v. 43, August '44, pp. 161-162.

Major economies are achieved by avoiding the slow process of drilling, separate dimpling, and hand rivet insertion operations; even piercing of holes in extrusions saves time.

20-317. **Master Tooling Dock Facilitates Assembly Fixture Building. II.** Thomas A. Dickinson. *Aero Digest*, v. 46, August 1, '44, pp. 80-82, 130.

Line vs. multi-line production; programming assembly tooling; developing the mockup.

20-318. **Some Aspects of Precision Grinding Practice.** R. Whibley. *Machinery* (London), v. 64, June 22, '44, pp. 679-685.

Some developments that increase the three modern requirements of accurate sizing, rate of output and finish.

20-319. **Determining Position Adjustments in Centreless Grinding.** P. Grodzinski. *Machinery* (London), v. 64, June 22, '44, pp. 686-689.

Correct truing of the wheel and the adjustment of the guide rail.

20-320. **A Critical Survey of Surface-Finish Parameters.** H. Peter Jost. *Machinery* (London), v. 64, June 22, '44, pp. 690-691.

The relative value of some of the most important of the commonly-used geometrical parameters that are based on the profile curve.

20-321. **Machine Tools and Production Equipment.** *Machinery* (London), v. 64, June 22, '44, pp. 692-695.

The unisaw; automatic sizing attachment for Monarch lathes; Bryant No. 112 internal grinder; safety stop for planer tables.

20-322. **15-in. Centre Tool-Testing Lathe.** *Engineering*, v. 157, June 23, '44, p. 486.

Lathe has a central height of 15 in. and admits work 11 ft. long between centers. The tool can be tried out on sufficiently large material to provide extended runs.

20-323. **Ammunition - Hoist Parts Efficiently Machined.** Gerald Eldridge Stedman. *Metals & Alloys,* v. 20, August '44, pp. 342-345.

Machine tool selection is made a function of the engineering, design and performance requirements of the particular part to be manufactured. The jig and fixture work is ingenious and is responsible for large savings in time and materials.

20-324. **Face Milling.** *Aircraft Production,* v. 6, July '44, p. 333.

Two types of negative rake cutters for high speed work.

20-325. **Hercules Engine Components.** J. A. Oates. *Aircraft Production,* v. 6, July '44, pp. 309-319.

Machining operations on the crankecase, impellor, sleeve, cylinder barrel and connecting rods.

20-326. **Some Aspects of Precision Grinding Practice.** R. Whibley. *Machinery* (London), v. 64, June 29, '44, pp. 709-713.

Methods of removing swarf from coolants; the influence of work diameter to wheel diameter ratio and of internal or external grinding on wheel speed; automatic sizing machine cycle; and grinding machines or attachments for special purposes.

20-327. **Torpedoes Assembled in Machine Setup.** *Iron Age,* v. 154, August 31, '44, pp. 42-46.

To assure precise alinement of the five sections of an 18-in. naval aircraft torpedo, final fitting and assembly is done with the aid of fixtures on a Cutmaster vertical turret lathe. The centerline method is used throughout in the machining operations on the principal components.

20-328. **Difficult Contours Turned With Simple Attachments.** Creighton Taylor. *American Machinist,* v. 88, August 31, '44, pp. 87-88.

Toolroom can make a similar device to convert engine lathes for turning molding dies of intricate, difficult shapes.

20-329. **Special Reamer Eliminates Honing and Polishing.** Charles Wolfe. *American Machinist,* v. 88, August 31, '44, p. 89.

A special carbide-tipped reamer, which provides a finish of between three and five micro-inches.

20-330. **Conveyors Cut Machining Time on Cylinder-Head Assemblies.** *American Machinist,* v. 88, August 31, '44, pp. 90-93.

Conveyors from former auto-engine assembly lines reduce the allotted times for machining and inspection operations on a P&W cylinder-head assembly engine.

20-331. **Naval Torpedo Propellers Machined to Precise Dimensions.** Carl G. Preis. *American Machinist,* v. 88, August 31, '44, pp. 117-120.

Largest torpedo weighs 17 lb. and is machined from

a 30-lb. steel forging. Propellers are carefully balanced to minimize vibration when in use.

20-332. **Electronic Control at Ford Motor Co. Enters Field of Drill Press Work.** P. D. Aird. *Modern Industrial Press,* v. 6, August-Sept. '44, pp. 17-18, 22.

Torque has been made to activate an electronic circuit with the result that drilling oil holes in an airplane crankcase section has been stepped up and with a resultant decrease in tool damage and part spoilage.

20-333. **Designing of Trouble-Free Dies.** C. W. Hinman. *Modern Industrial Press,* v. 6, August-Sept. '44, pp. 20, 22.

Broaching dies and machines. Shallow broaching cuts done in ordinary punch presses and in horizontal and hydraulic presses.

20-334. **Planer Type Milling Machines Built from Sub-Assemblies.** A. Dürr. *Werkstattstechnik der Betrieb,* v. 37/22, no. 6, June '43, pp. 233-237. *Engineers' Digest,* v. 1, August '44, pp. 506-509.

Face milling cutters, especially of hard metal, are often superior to planer tools for roughing, smoothing or finishing as well as for machining cast iron, steel or light metal. The accuracy and the surface finish of all the milled faces are the same and therefore meet high demands.

20-335. **United States Rubber Company; Maker and User of Machine Tools.** Fred B. Stauffer. *Modern Industrial Press,* v. 6, August-Sept. '44, pp. 30, 38.

Types of metal-working machinery produced by the U. S. Rubber plant.

20-336. **Modern Milling-Cutter Production.** F. Müller. *Werkstattstechnik der Betrieb,* v. 37/22, no. 4, April '43, pp. 153-154. *Engineers' Digest,* v. 1, August '44, pp. 514-515.

Production of large cutters of the disc type with diameters up to 520 mm. and cutting edges up to 35 mm. of a welded composite type.

20-337. **Recent Progress in High Speed Tapping.** C. W. Hinman. *Modern Machine Shop,* v. 17, Sept. '44, pp. 164-166, 168, 170, 172, 174, 176, 178, 180, 182.

Tapping machine improvements — lubricants and coolants—special tapping fixtures.

20-338. **Arbor Adapter for Gear Cutter.** *Modern Machine Shop,* v. 17, Sept. '44, p. 210.

Faster and more accurate positioning of the small arbors used in the cutting of small precision gears.

20-339. **New Records in Face Milling.** Guy Hubbard. *Steel,* v. 115, Sept. 4, '44, pp. 84-85, 144, 146, 148.

Advantages of face milling.

20-340. **Machining Operations on Anti-Aircraft Gun Mountings.** *Machinery* (London), v. 65, July 13, '44, pp. 29-33.

Effectiveness of the 90-mm. anti-aircraft gun due to the ease and exactitude with which it can be aimed in response to the range-finder control. This arises from the accuracy with which the traversing assembly, elevating assembly, and levelling assembly—all units of the gun mount—are built. Examples of work done on these assemblies described.

20-341. **Hob-Tooth Profiles for Spline Hobbing.** J. G. Smith. *Machinery* (London), v. 65, July 13, '44, pp. 35-39.

Line of action and basic rack; the hobbing process; analytical method; grinding clearance.

20-342. **A Lathe Converted into a Broaching Machine.** R. C. Newton. *Metal Progress*, v. 46, Sept. '44, p. 486.

Broaching lugs in the interior of some 2-in. rings by adapting a lathe with a chuck holding a bronze nut, a lead screw, a steel sleeve attaching the broach, and the work holder on the tool rest.

20-343. **Friction Cutting.** *Aircraft Production*, v. 6, August '44, pp. 403-404.

High speed sawing process suitable for most types of material.

20-344. **High Velocities in Band Saw Performance.** H. J. Chamberland. *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190.

Equipment described incorporates all-purpose design; results depend on using the correct type of saw to suit the nature of the material being cut and use of the saw according to recommendations.

20-345. **Composite Hob May Solve Marine Gear Bottleneck.** *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 199-200, 202, 204, 206, 208.

Consists of a hob body and mechanically held strips of cemented carbide for the cutting edges.

20-346. **Let's Talk Shop.** *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 265-266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286.

Staggered tooth vertical milling cutter; checking pump gears; coffin jacks eliminate liner shrinkage gaps; reclaiming old pipe; multi-spindle mill cuts boring time; umbrella type assembly bench; double-edge milling cutter eliminates one operation; special tool catalog; die handling; climb milling with single carbide blade.

20-347. **Jigs for a Gear Bracket.** N. D. P. *Machinery* (London), v. 65, August 3, '44, p. 121.

Jig used in drilling and reaming operations on the flange of a special gear bracket.

20-348. **The Standardization of Tube Jigs.** F. E. Callow. *Machinery* (London), v. 65, August 17, '44, p. 183.

Location buttons eliminate distortion in drilling. Casting does not require machining to fit the various diameters of tubes. Buttons are of standard design for all types of jigs, being case hardened and ground on assembly. They are easily replaceable in the event of wear, or alteration in the diameter of the tube.

20-349. **The Production of the Wickman 5-Spindle Automatic.** *Machinery* (London), v. 65, August 17, '44, pp. 169-175.

Assembly and testing operations.

20-350. **Mass Production in Heavy Industry.** Jerome Wilford. *Tool Engineer*, v. 14, Sept. '44, pp. 67-69.

A West Coast manufacturing leader tooled for high output of heavy parts from standard machine tools.

Materials handling was aided by portable tools taken to the work.

20-351. **Machining Magnesium.** A. M. Lennie. *Tool Engineer,* v. 14, Sept. '44, pp. 70-73.

One of the easiest metals to machine, magnesium improperly handled can be dangerous. Shop-proved practice for important machining operations, with recommended methods for fire precaution.

20-352. **Special Tooling and Machines for Economy in Production.** *Tool Engineer,* v. 14, Sept. '44, pp. 78-82.

Automatics replace older equipment; multiple checking fixture; brazing facilitates use of stampings; truck frame inversion fixture; heavy-duty truck assembly.

20-353. **Heavy Tapping.** A. E. Rylander. *Tool Engineer,* v. 14, Sept. '44, pp. 86-87.

Tapping and drilling methods may economically supplement conventional lathe practice. Attachments may be used and re-used profitably on long or short runs.

20-354. **Aids to High Production Tapping.** Mark Graves. *Tool Engineer,* v. 14, Sept. '44, pp. 91-94.

Increased use of universal tapping and threading machines has sharpened need for information on speeds and feed, drill sizes for the per cent of thread desired, lubrication, and hole preparation. Here is up-to-the-minute data from an authority.

20-355. **Using Negative Rake Tools in Aircraft-Parts Production.** J. Q. Holmes. *Mechanical Engineering,* v. 66, Sept. '44, pp. 576-580.

Negative rake cutting investigated; putting the new process into production; milling operations; operating precautions must be taken; tooth load and number of teeth; power requirements.

20-356. **New Lathe Speeds Machining of Crankpins.** *Product Engineering,* v. 15, Sept. '44, pp. 590-593.

Tools are carried around the work which is supported in a stationary position on stanchions.

20-357. **Cost of Parts Finished by Grinding is Reduced by Correct Design.** S. H. Neady. *Product Engineering,* v. 15, Sept. '44, pp. 632-634.

Production considerations and practice that should govern the design of ground cylindrical parts to obtain low cost. Original and redesigned parts described to show how time-wasting operations can be eliminated and the performance and life of grinding wheels increased by correct design.

20-358. **Basic Mechanics of the Metal-Cutting Process.** M. Eugene Merchant. *Journal of Applied Mechanics,* v. 11, Sept. '44, pp. A-168-A-175.

A mathematical analysis of the geometry and mechanics of the metal-cutting process, covering two common types of geometry which occur in cutting. This analysis offers a key for the study of engineering problems in the field of metal cutting in terms of such fundamental quantities as strain, rate of shear, friction between chip and tool, shear strength of the metal, work done in shearing the metal and in overcoming friction.

20-359. **Crush Forming Speeds Production of Ground Contours.** John Haydock. *American Machinist*, v. 88, Sept. 14, '44, pp. 98-101.

Hard steel rollers used to dress abrasive wheels to a wide variety of shapes, which in turn can be transferred to the workpiece in a grinding machine.

20-360. **Practical Suggestions for Improvement of Twist Drills.** George J. Meyer. *American Machinist*, v. 88, Sept. 14, '44, pp. 106-108.

New ideas in twist drill design, including a completely different method of driving and chucking.

20-361. **Practical Ideas.** *American Machinist*, v. 88, Sept. 14, '44, pp. 109-114.

Fixture for grinding small tapered sleeves. Milling, drilling tools combined in one set-up. Long stock lathe set-up which eliminates a steadyrest. Lay-off punch holder used as a layout tool. One-position radius grinding fixture. Set-up bar assures accuracy in regrinding milling cutters. Screw tap gage. Freight car doors hung by a lift truck. Stock supports on abrasive cutoff machines. Reconverted trammel proves a handy tool for inspection and layout work. Rubber lower die for forming sharp angles.

20-362. **Unusual Fixtures Employed in Making Torpedo Tail Cones.** Carl G. Preis. *American Machinist*, v. 88, Sept. 14, '44, pp. 121-124.

Naval units made from heavy steel forgings are subjected to careful inspection checks during machining and assembly operations.

20-363. **Drilling Structural Angles Simplified.** C. W. Hinman. *American Machinist*, v. 88, Sept. 28, '44, p. 95.

Design and construction.

20-364. **Heavy Slotting Tools Devised for Turret Lathes.** E. Sperisen. *American Machinist*, v. 88, Sept. 28, '44, pp. 98-101.

Special tools permit the use of worn milling cutter blades in producing large torsional vibration dampeners for diesels.

20-365. **Special Tools Used to Cut Turbine Wheel Buckets.** Carl G. Preis. *American Machinist*, v. 88, Sept. 28, '44, pp. 102-104.

Hand filing among tasks which are eliminated by automatic machines developed by company.

20-366. **Taking Tools to Heavy Work by a Jib Crane.** J. I. Karash. *American Machinist*, v. 88, Sept. 28, '44, pp. 105-106.

Many parts to be machined in this plant were too heavy to handle by hand so a jib crane was designed whereby the spindle could be positioned to the work.

20-367. **Air Operated Jig for Bearing Shells.** I. F. Huey. *American Machinist*, v. 88, Sept. 28, '44, pp. 110-111.

Air cylinders clamp and locate bearing halves for drilling, and eliminate separate drill jigs.

20-368. **Grinding Problems Overcome by Revision of Shop Practices.** J. S. Steiner and S. H. Neady. *American Machinist*, v. 88, Sept. 28, '44, pp. 108-109.

Typical examples of processing steps adopted to eliminate difficulties in producing small lot pieces.

20-369. **Practical Ideas.** *American Machinist*, v. 88, Sept. 28, '44, pp. 115-120.

Adapting a shaper to cutting off tubing. Special adapter reclaims discarded grinding wheels. Novel die for securing motor laminations. Checking angles to minutes on a common protractor. Multiple stock dial indicates the progress of each lathe cut. Shear pin eliminates spindle fork breakage. An oil can that works uphill. Ramps and dollies ease labor in changing car wheels. Scriber on planer gage used for layouts. Adjustable stop adapter for use in lathe collets. Boring tools mounted in removable bars. Automatic feed of small parts reduces grinding time.

20-370. **Milling with Carbides.** *Western Metals*, v. 2, Sept. '44, pp. 44, 47.

Through the use of carbide-tipped cutters, superior finishes have been produced on steel and dural at speeds and feeds up to 1000% of conventional rates. Technique consists of: All-inclusive rigidity of the machine, cutter, arbor, fixture and part; careful selection of speeds; heavy "chip load"; climb milling or plunge cutting; constant momentum.

20-371. **A Precision Tool: The Single Blade, Piloted, Expansion Reamer.** Albert W. Ehlers. *Tool and Die Journal*, v. 10, Sept. '44, pp. 107-109.

Method of employing the "Single Blade High Finish Piloted Expansion Reamer" in everyday production.

20-372. **Tool Room Surface Grinding—Part II.** J. E. Corbett. *Tool and Die Journal*, v. 10, Sept. '44, pp. 110-112.

Parallel surfaces; squares; grinding mutually square surfaces.

20-373. **Grinding Accurate Cam Surfaces.** Paul Stoner. *Machinery*, v. 51, Sept. '44, pp. 163-166.

Points to be considered in grinding intentionally out-of-round surfaces, such as cams, eccentrics, and elliptical or relieved pistons.

20-374. **Lapping Piston Rings.** H. S. Indge. *Steel*, v. 115, Sept. 25, '44, p. 98.

For radial aircraft engines; involves careful preparation of surface and use of retainer rings to close piston rings to shape they assume when assembled. Hyprolap machines and the bonded abrasive laps employed are described.

20-375. **High-Speed Milling.** *Automobile Engineer*, v. 34, August '44, pp. 329-330.

American developments in the machining of light alloys; spar milling; milling heads; stock removal; feeds; coolants in high speed milling; more recent developments.

20-376. **Hyper-Milling.** *Automobile Engincer*, v. 34, August '44, pp. 335-337.

Feeds and speeds; examples to show the effect different conditions have on the power required at a tool. Examples given of actual production figures.

20-377. **The Production of the Wickman 5-Spindle Automatic.** *Machinery* (London), v. 65, August 10, '44, pp. 141-146.
Operations on the spindle drum and other parts.

20-378. **Securing Fine Surfaces by Grinding.** H. J. Wills. *Machinery* (London), v. 65, August 10, '44, pp. 149-152.
Application of dressing tools.

20-379. **Roll Grinder.** *Iron & Steel,* v. 17, August '44, pp. 570-571.
Traveling type wheelhead unit for straight and camber profiling.

20-380. **Electronically-Controlled Adjustable-Speed Motors.** B. T. Anderson. *Machinery* (London), v. 65, August 24, '44, pp. 197-205.
Special applications to lathes and milling machines.

20-381. **Securing Fine Surfaces by Grinding.** H. J. Wills and H. J. Ingram. *Machinery* (London), v. 65, August 24, '44, pp. 210-212.
For surface quality better than 5 to 10_{μ}-inches r.m.s., it is usually assumed that it is a job for honing or lapping. For closest work, lapping is usually specified.

20-382. **Formulae for Machining V-Channels.** R. A. L. *Machinery* (London), v. 65, August 24, '44, pp. 213-214.
Calculating the position where the cut must be started and also the depth to which such a tool must be taken in order to produce the correct width.

20-383. **Plastic and Metal-Bonded Diamond Wheels.** J. B. H. *Machinery* (London), v. 65, August 24, '44, pp. 215-216.
Respective fields of application.

20-384. **Precision Work on Old Lathes Permitted by Attachment.** *Iron Age,* v. 154, Sept. 28, '44, pp. 63, 136.
Combination tool holder and follow rest designed to overcome the difficulty encountered in turning or threading long shafts of small diameter.

20-385. **Machining of Light Alloys with Diamond Tools.** *Light Metals,* v. 7, Sept. '44, pp. 430-436.
Advantages of diamond as a cutting material and referring in particular to the machining of aluminum alloy pistons. 29 ref.

20-386. **Special Equipment to Facilitate the Efficient Use of Diamond Tools.** G. Schlesinger and D. F. Galloway. *Machinery* (London), v. 65, August 31, '44, pp. 233-235.
Orientation of faceted diamond tools; adjustment of rake.

20-387. **Super-Milling Introduces Flywheels to Machine Tools.** Guy Hubbard. *Steel,* v. 115, Oct. 2, '44, pp. 68-69, 109-110, 112.
Widespread adoption in connection with wartime tooling, of these hitherto unfamiliar elements, foreshadows their incorporation into basic designs of postwar milling machines and certain other machine tools.

20-388. **Vertical Assembly.** *Steel,* v. 115, Oct. 2, '44, pp. 70-71, 86, 88.
Method of constructing aircraft torpedoes achieves precise balance and alignment. Center-line theory—

developed for this application—inspires creation of clever jigs and arbors, simplifies machining of fittings and castings; dominates assembly of sections on large lathe.

20-389. **Modern Machine Tools.** *Aircraft Production,* v. 6, Sept. '44, pp. 430-432.

Gear hobbing; gear shaving; lapping; screwing; stripping press.

20-390. **Spar-Boom Milling.** *Aircraft Production,* v. 6, Sept. '44, pp. 438-442.

The Wadkin LZ6 machine. Speed range for carbide cutting alloys. Hydraulic copying equipment and full automatic machining cycle.

20-391. **Tool Control Practiced at the Puget Sound Navy Yard.** W. E. Ainsworth. *Mechanical Engineering,* v. 66, Oct. '44, pp. 631-637.

Centralized tool control has many advantages; reconditioning high-speed twist drills; tool-and-die making and repair; tool grinding; inventory; storage of tools in toolrooms; issuing tools; miscellaneous duties.

20-392. **Accurate Grinding Depends Upon Correct Location of Surfaces.** S. H. Neady. *American Machinist,* v. 88, Oct. 12, '44, pp. 110-112.

Difficulty in securing correct lateral dimensions or correct relationship on ground parts is frequently due to incorrect use of multiple locating points.

20-393. **High Production with Radial Drilling Machines.** Jerome S. Wilford. *Tool Engineer,* v. 14, Oct. '44, pp. 71-73.

West Coast shop speeds extensive drilling and boring operations with ingeniously designed jigs and fixtures. Skill requirement is low.

20-394. **Future of Carbide Milling on Special Machines.** Milton J. Steffes. *Tool Engineer,* v. 14, Oct. '44, pp. 85-86.

The advent of machinery with higher spindle speeds and high horsepower ratings has shown that carbide-tipped cutters can be used with as few as 20% of the number of teeth used in high-speed steel cutters.

20-395. **Tooling the Drill Press for Multiple Machining Operations.** *Tool Engineer,* v. 14, Oct. '44, pp. 87-89.

Driver bar, actuated by drill press spindle, carries tools which adapt machine to perform four operations —a typical turret lathe job.

20-396. **Line Piercing.** Wesley F. Cook. *Tool Engineer,* v. 14, Oct. '44, p. 99.

Designed to give the same results as line-drilling, this punch press setup permits a much higher output. Cost of a die and a well-supported slender punch are about the same as for a drill jig for the same job.

20-397. **Qualification Test Specimens.** R. V. Anderson. *Welding Engineer,* v. 29, Oct. '44, pp. 42-43.

Machining, flame cutting, hand grinding and abrasive cutting wheels.

20-398. **Undercuts in Place of Fillets Simplify Cylindrical Grinding.** S. H. Neady. *Product Engineering,* v. 15, Oct. '44, pp. 707-708.

Considerations dictated by stress and strength factors, grinding practice requirements and equipment available, which govern the design of sharp corners, reliefs and fillets at inside corners of shoulders on cylindrical parts. Design standards that observe the factors discussed will result in increased production and reduced shop costs.

20-399. **Tooling for High-Speed Machining of Magnesium Base Die Castings.** Chris Adamski and G. Austin Fanning. *Die Casting,* v. 2, Oct. '44, pp. 76-78, 80-81.

Type of tool designed for the high speed machining of thin-walled magnesium alloy die castings.

20-400. **New Super Speed Punch Press Employs New Operating Principle.** *Modern Industrial Press,* v. 6, Oct. '44, pp. 26, 28.

The horizontal bed or plate upon which the die is secured is horizontally reciprocated by an eccentric driving crank. The horizontal movement of the die is in the same plane and direction in which the work strip is fed. The press ram, upon which the punch holder with its punches are attached, is reciprocated vertically by the same crank movement that oscillates the die.

20-401. **Adaptations of the Herbert No. 4 Senior Capstan Lathe.** *Engineering,* v. 158, Sept. 22, '44, pp. 226-227.

The Herbert No. 4 Senior "Eloptive" capstan lathe and an alternate arrangement of the headstock of the No. 4 Senior capstan lathe proper.

20-402. **Clamping Devices for Jigs and Fixtures.** *Die Werkzeugmaschine,* v. 47, no. 6, March '43, pp. 129-132. *Engineers' Digest,* v. 1, Sept. '44, pp. 571-572.

A few typical devices.

20-403. **Automatic Drum Type Fixture Speeds up Drilling Work.** C. R. Phiffer. *Machinery,* v. 51, Oct. '44, pp. 151-152.

Devised for drilling large quantities of small aluminum supports.

20-404. **Machining Group-Forged Trip Levers.** Frank Hartley. *Machinery,* v. 51, Oct. '44, pp. 168-170.

Group milling of four parts from one forging.

20-405. **Machining Steel Parts on Automatic Screw Machines With Carbide Tools.** *Machinery,* v. 51, Oct. '44, p. 185.

Carbide-tipped tools give excellent results in machining both carbon and alloy steels in automatic screw machines. Production can be increased, unit costs reduced, and tool life prolonged.

20-406. **New Developments in Honing.** *Iron Age,* v. 154, Oct. 19, '44, pp. 67, 150, 152.

Automatic gaging of work in process, making production runs speedy and economical, and hogging out of heavier sections than were previously deemed practical are twin attributes of a new line of honing machines and sticks.

20-407. **High Speed Milling.** Kenneth Macker. *Metals and Alloys,* v. 20, Oct. '44, pp. 949-953.

Negative rake cutting defined; making the milling cutters; performance on specific jobs.

20-408. **The Art of Metal Cutting.** H. A. Frommelt. *Machine Tool Blue Book*, v. 40, Oct. '44, pp. 133-134, 136, 138, 140, 142, 144, 146, 148, 150, 152.

Historical developments.

20-409. **Carbide Milling of Steel.** H. L. Pope. *Machine Tool Blue Book*, v. 40, Oct. '44, pp. 157-158, 160, 162, 164, 166, 168, 170.

Progress toward a merger of art with science in the field of milling has been greatly stimulated during the past few years by the employment of super-high speeds, carbide cutting tools, and extremely careful determination of interrelated tooth angles.

20-410. **Fundamentals in Milling Practice.** H. A. Frommelt. *Machine Tool Blue Book*, v. 40, Oct. '44, pp. 199-200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 222, 224, 226, 228, 230.

Three fundamental principles of good machine tool practice: Good work piece set-ups, proper choice and assembly of cutters, and correct operation of the machines. Milling machine set-ups should be considered in terms of these fundamental principles.

20-411. **Sharpening Cutters for High Speed Carbide Milling.** *Machine Tool Blue Book*, v. 40, Oct. '44, pp. 243-244, 246, 248, 250, 252, 254, 256, 258, 260.

The grinding of carbides, like the entire high speed carbide milling program, is rapidly and continually undergoing improvements. Departures from, or improvements over previous recommendations.

20-412. **Machining Operations on the Sperry Gyro-Compass.** H. L. H. *Machinery* (London), v. 65, Sept. 7, '44, pp. 261-264.

The sensitive element; a profile-milling operation, balancing the rotor.

20-413. **Negative Rake on Cemented-Carbide Cutting Tools.** *Machinery* (London), v. 65, Sept. 14, '44, pp. 281-289.

Feeds and speeds for cemented-carbide tools; use of carbide tools on steel; positive and negative rake milling compared; arbors; the milling cutter.

20-414. **Punch & Form Shaping Machine.** *Engineering*, v. 158, Sept. 29, '44, p. 246.

Designed primarily for the shaping of punches, particularly those of irregular contour in cross-section, an operation it accomplishes by employing an ordinary cutting tool which makes a reciprocating stroke over the operative length of the punch and finishes with a radial movement at the end of the stroke.

20-415. **Taper Line-Reaming of Ship Propeller-Shaft Flanges.** G. P. Bowman. *Machinery* (London), v. 65, Oct. 5, '44, pp. 373-374.

Equipment for doing this job in minimum time and with the holes reamed within a tolerance of 0.001 in. or less to receive fitted flange bolts has recently been developed at the Joshua Hendy Iron Works.

20-416. **Thread Recesses.** D. G. Haddock. *Machinery* (London), v. 65, Oct. 5, '44, pp. 375-376.

Determination of the most suitable width for the thread recess.

20-417. **Keighley Internal - grinding Machine Attachments.** *Machinery* (London), v. 65, Oct. 5, '44, pp. 385-386.

Machine equipped with an auxiliary facing and cylindrical grinding head, sliding-jaw collet chuck, chuck-operating mechanism and a rotary diamond dresser.

20-418. **Punches and Dies.** *Automobile Engineer,* v. 34, Oct. '44, pp. 417-419.

Some English machines developed for sawing, filing and shaping.

20-419. **"Borlocator" Jigs and Fixtures.** *Tool & Die Journal,* v. 10, Oct. '44, pp. 132-133.

A method whereby an infinite variety of production and/or inspection jigs and fixtures can be readily and accurately assembled.

20-420. **Refrigeration of Coolants for Machine Tools.** B. S. Williams. *Heating & Ventilating,* v. 41, Oct. '44, pp. 63-66.

High cutting speeds may cause a welding action between the chip and the tool, and a softening of the tool edge. This results in a poor finish, excessive tool wearing, and loss of production. To reduce these high temperatures, refrigeration of the coolant or cutting oil has been successfully employed.

20-421. **Plastic Masters Assure Accurate Checking of Assembly Jigs.** Rupert Le Grand. *American Machinist,* v. 88, Oct. 26, '44, pp. 91-94.

Cast-plastic replicas of lofted aircraft sub-assemblies need not be stored under controlled temperature and humidity conditions in order to be certain that they retain dimensional stability.

20-422. **Fixture Spaces Keyways Accurately.** Carl G. Preis. *American Machinist,* v. 88, Oct. 26, '44, p. 95.

Device for milling keyways on torpedo propeller shafts to close tolerances, 90° apart.

20-423. **Thread Errors Can Be Overcome Through Slight Cutter Design Changes.** Roger W. Bolz. *American Machinist,* v. 88, Oct. 26, '44, pp. 98-100.

Undercutting by a thread mill can be prevented by correcting the tooth form in accordance with calculations to learn the amounts and position of error.

20-424. **Diamond Tools Easily Fabricated for Any Shop Need.** E. J. Summerill. *American Machinist,* v. 88, Oct. 26, '44, p. 101.

Diamonds used for dressing or truing grinding wheels usually are mounted in their natural form, but can be sharpened to a point or chisel edge depending upon the type of duty required.

20-425. **Fly Cutters Used to Form-Mill Contours on Compressor Rotors.** Milton Hoeppner. *American Machinist,* v. 88, Oct. 26, '44, pp. 102-104.

Special cutters which replace the usual form-milling tools are made by inserting steel bits in the cutter body, which is made integral with its arbor.

20-426. **Practical Ideas.** *American Machinist*, v. 88, Oct. 26, '44, pp. 105-110.

Grinder which sharpens all reamers uniformly to standard taper. Broken shafts repaired by butt welding. Hold-down plate for drilling bundles of aluminum blanks. Tailstock prevents chatter of boring bars. Lathe toolholder with a wide range of uses. Cutter grinder with indexing plate used for tool grinding. Device for drilling at 90° to contoured surfaces. Radial drill jig locking devices. Turning small slender parts on a lathe. Bandsaw trim guide eliminates scribing from templets.

20-427. **Pneumatic Clamps Simplify Tooling.** C. H. Bodner. *American Machinist*, v. 88, Oct. 26, '44, pp. 111-118.

Make full use of pneumatic clamping by stocking standard air vises and cylinders, and adapting them to machining set-ups.

20-428. **Cemented - Carbide Cutting Tools.** *Machinery* (London), v. 65, Oct. 12, '44, pp. 393-400.

Special reference to applications and tests of tools with negative rake.

20-429. **Diamond Powder and Its Applications.** *Machinery* (London), v. 65, Oct. 12, '44, pp. 403-405.

Production methods; diamond dies and diamond-tipped tools; operation on jewel bearings, quartz, knife edges and crystal optical glass working; sintered carbide tools and dies.

20-430. **Jig for Boring Thin Steel Rings.** A. L. Sims. *Machinery* (London), v. 65, Oct. 12, '44, pp. 406-407.

The gripping and releasing of the ring to be machined is obtained from the up-and-down movement of the drilling-machine spindle.

20-431. **Hyperbolic Boring of Holes.** *Machinery* (London), v. 65, Oct. 12, '44, pp. 408-409.

Prevents edge pressure in bearings being caused by the elastic deflection of shafts.

20-432. **Simplifying Cowl Fabrication.** *Machine Tool Blue Book*, v. 40, Nov. '44, pp. 165-166, 168, 170, 172, 174, 176.

Eliminating eight parts that previously had to be assembled by spot welding and riveting methods into one piece of cowling, has effected a saving of 112 man-hours per airplane.

20-433. **An Investigation of Radial Rake Angles in Face Milling.** J. B. Armitage and A. O. Schmidt. American Society of Mechanical Engineers *Transactions*, v. 66, Nov. '44, pp. 633-643.

The effect of negative and positive radial rake angles in milling cutters upon the power required for the cutting action, the tool life of the cutter, the surface finish, and temperature of the workpiece. 9 ref.

20-434. **Hollow Mills Used in Machining Die Cast Cylindrical Plugs.** *Die Castings*, v. 2, Nov. '44, pp. 62-64.

Combination box tool and hollow milling head for finishing the outside diameters of die cast plugs for

cylinder locks. Details of the cutting bits and guide bits.

20-435. **Machining — Usual and Unusual — That Makes Die Castings Practicable.** *Die Casting,* v. 2, Nov. '44, pp. 73-74, 77-79.

Precision machining of small motor parts involves careful tooling and fixture set-ups to prevent distortion of thin-wall sections. Describes several high speed machining operations developed for die cast parts.

20-436. **Recent Progress in High Speed Tapping, II.** C. W. Hinman. *Modern Machine Shop,* v. 17, Nov. '44, pp. 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160.

Ideal set-up for precision tapping. Considerations in the design of tapping fixtures. Tapping suggestions.

20-437. **Tooling Revisions.** G. Eldridge Stedman. *Steel,* v. 115, Nov. 6, '44, pp. 110-113, 142.

Reduce machining time about two-thirds, help cut man-hours for production of B-25 Mitchell bombers from 16,000 to only 6000. Costs likewise greatly reduced by flywheel type coarse-tooth milling cutters and efficient fixtures.

20-438. **The Behavior and Control of Wet Wire Drawing Lubricants for Copper.** Robert C. Williams. *Wire & Wire Products,* v. 19, Nov. '44, pp. 771-772, 805.

Variables in the use of lubricants; water as a variable; control and influence of pH; mechanical design effects; laboratory control.

20-439. **Effect of Coolant Fluid Temperatures on Cutting Tool Efficiency.** *American Machinist,* v. 88, Nov. 9, '44, pp. 96-99.

Cutting fluid evaluation tests established various temperature values for the highest cutting speeds and longest tool life.

20-440. **Dowel-Pin Holes Precision Bored.** Milton Hoeppner. *American Machinist,* v. 88, Nov. 9, '44, pp. 100-101.

Boring of dowel-pin holes to insure accurate assembly.

20-441. **High Speeds and Few Teeth Add to Cutter Life and Accuracy.** Roger W. Bolz. *American Machinist,* v. 88, Nov. 9, '44, pp. 102-104.

Cutters should be designed so number of teeth permit maximum feed. Abrasive action and heat will be reduced and add to service life of thread mills.

20-442. **Practical Ideas.** *American Machinist,* v. 88, Nov. 9, '44, pp. 107-112.

Two grinding operations combined. Bakelite mold that eliminates flash. Production tripled by revision of a milling process. Special guard removes hazards in grinding carbide-tipped tools. Novel milling cutter for finishing hard, dirty castings. Adjustable drill jig locates centers on metal strips. Friction block prevents scarring of work by shaper tools. Improvised boring tool for removing broken drill points. A duplex form block.

20-443. **Collet Chucks of Special Design.** Donald A. Baker. *Machinery,* v. 51, Nov. '44, pp. 166-168.

Design details.

20-444. **An Appraisal of Precision Thread Rolling Practice.** Frank J. Oliver. *Iron Age,* v. 154, Nov. 2, '44, pp. 48-55, 132, 134.

Factors bearing on the problem of rolling thread in high strength alloy steel with hardnesses ranging up to Rockwell C-36 and with tolerances corresponding to Class 3 and 4 fits. General principles are discussed and the characteristics of both straight and cylindrical die machines described.

20-445. **Grinding Compound Angles on Forming Tools.** Charles L. Hall. *Tool Engineer,* v. 14, Nov. '44, pp. 67-69.

Easy to use formulas developed from long toolroom experience, save hours of cut-and-try, and assure holding cutting angles through continued regrinding. They can be applied to determine unknowns wherever similar compound angles may occur.

20-446. **Special Cutting Head Speeds Boring Mill Output.** Carl Eberhardt. *Tool Engineer,* v. 14, Nov. '44, pp. 70-72.

Tooling flexibility accounts for speed and economy in the growing number of short run orders. How it is done.

20-447. **Tooling Dock Aids Jig Boring.** Thomas A. Dickinson. *Tool Engineer,* v. 14, Nov. '44, pp. 88-91.

Designed for the aircraft industry, the master tooling dock is useful in the automotive field, or wherever economical production depends upon the development of precise and coordinate tools and gages. Addition of accessories for precision boring adds to its practical possibilities.

20-448. **The Selection and Use of Cutting Fluids.** H. W. Fowler. *Steel,* v. 115, Nov. 13, '44, pp. 122, 125-126.

Detailed consideration of origin and development of cutting fluids provides ready index for improved production procedures. Tables of machinability simplify selection of correct fluid type for any job.

20-449. **An Appraisal of Precision Thread Rolling Practice.** Frank J. Oliver. *Iron Age,* v. 154, Nov. 16, '44, pp. 64-69.

Methods of obtaining rigid control of blank diameter are discussed and typical thread failures are analyzed. Cooling and filtration of lubricants adds to die life.

20-450. **Negative Rake Milling.** *Metal Treatment,* v. 11, Autumn '44, pp. 189-192.

High speed milling with cemented carbide tipped negative rake cutters. Principles briefly explained.

20-451. **Coordinate Layout Calculations for Jig Borer Work.** Stephen E. Woodbury. *Iron Age,* v. 154, Nov. 23, '44, pp. 60-62.

Methods and formulas for calculating with comparable accuracy the dimensions needed for the drawing. Examples for holes arranged in a triangle and in a circle, taking the difficult case involving a prime number of holes. Several checks are given.

20-452. **Machining Cylinder Heads for the Merlin Engine.** *Machinery* (London), v. 65, Oct. 26, '44, pp. 449-456.

Rolls-Royce methods at a Ministry of Aircraft production factory.

20-453. **Points in Production Planning.** D. Braid, *Machinery* (London), v. 65, Oct. 26, '44, pp. 462-464.

Machine loading; modification to design; economic quantities.

20-454. **Careful Cutter Sharpening Equal in Importance to Proper Design.** Roger W. Bolz. *American Machinist,* v. 88, Nov. 23, '44, pp. 102-103.

Three types of runout which occur through faulty equipment may cause uneven thread form and reduce cutter life greatly.

20-455. **Practical Ideas.** *American Machinist,* v. 88, Nov. 23, '44, pp. 107-112.

A handy master jig for flat jobs. Two-step reamer speeds up production. Mandrel maintains uniform thickness of swaged tubing wall. Design of special equipment based on shape of parts. Holding device for small runs of odd-shaped parts. Auxiliary toolslide grooves part while finish turning on automatic. Change of methods and cutters reduces milling time. Four-way inspection block speeds gaging of small parts. Fixture for grinding multisided sections on bar stock. Fixture attachment removes parts without marring to avoid reworking.

20-456. **Selection and Application of Single-Point Tools.** *American Machinist,* v. 88, Nov. 23, '44, pp. 113-124.

To obtain maximum production from cutting tools: (1) Selection of the right tool for the job, (2) proper tool sharpening, (3) proper use of the tool in the machine, and (4) having enough tools on hand so there will be no loss of machine time for resharpening and replacement.

20-457. **Boosts Production of Tough Steel Link.** Delmer H. Rhino. *Steel,* v. 115, Nov. 27, '44, pp. 81, 122.

Carbide tipped shell end mill with negative rake.

20-458. **Methods and Equipment Used for High-Production Grinding.** R. P. *Machinery* (London), v. 65, Nov. 9, '44, pp. 513-516.

Applying sizing devices to a variety of gaging and measuring problems.

20-459. **Machine Tapping and Tapping Head Attachments.** H. J. Andrew. *Machinery* (London), v. 65, Nov. 9, '44, pp. 522-523.

Machine-tapping small-diameter full-thread blind holes in tough material.

20-460. **Machining Fatigue Test Pieces.** H. Ford. *Machine Shop Magazine,* v. 5, April '44, pp. 44-46. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 158-A.

Accurately curved necks were required to be turned on cylindrical specimens for fatigue testing and the lathes available were unsuitable for the work. Description of a radius-turning attachment designed for

this work and proved satisfactory when mounted on one of the lathes.

20-461. **Comparative Cutting Tests of a Diamond Tool and a High-Speed Tool.** M. E. Merchant. *Industrial Diamond Review,* v. 4, June '44, pp. 119-124. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 158-A.

Investigations carried out by the research department of the Cincinnati Milling Machine Co., to find the coefficient of friction between a diamond cutting tool and the chip described. For comparison purposes the tests were also made on a tool of 18-4-1 high speed steel.

20-462. **How to Choose and Use Carbide-Tipped Tools.** J. Jacquet. *La Pratique des Industries Mecaniques,* v. 26, no. 10, Jan. '44, pp. 147-152. *Engineers' Digest,* v. 1, Nov. '44, pp. 682-685.

Recommendations; cutting conditions; control of tools; types of carbide-tipped tools.

20-463. **Machining of Plastics with Ceramic Tools.** W. Osenberg. *Plastics,* v. 8, Nov. '44, pp. 509-514.

Manufacture of ceramic tools; tool life investigation. 10 ref.

20-464. **Hydro-Piercing Difficult Steel Plates.** C. W. Hinman. *Steel Processing,* v. 30, Nov. '44, pp. 714-717.

Piercing awkwardly shaped parts, stoker panel holes, holes in front fenders hydraulically, fenders; stripper plates clamp and position the work; piercing, coining and flanging in one operation.

20-465. **Safety in the Use of Metal-Working Milling Machines.** *Western Metals,* v. 2, Nov. '44, pp. 84, 86.

Compilation of experience.

20-466. **New Accuracy and Perfection of Finish Achieved by Liquid Honing.** *Steel,* v. 115, Nov. 27, '44, p. 100.

Peening effect of abrasive emulsion also improves physical properties and fatigue life of metal parts. Increases of 200% in tool life achieved.

20-467. **Broaching Vs. Milling in Manufacturing Rifle Parts.** I. A. Swidlo. *Iron Age,* v. 154, Dec. 7, '44, pp, 62-69, 156.

The substitution of broaching for milling operations on the Garand semi-automatic Ml rifle has resulted in a decrease of 57% in the cost of manufacture and 50% in the number of manhours required. Analysis of comparative capital costs for equal production. Broach tooling for the heaviest part of the rifle, the receiver.

20-468. **Cutter Body Materials Selected with an Eye to Application.** M. Martellotti. *American Machinist,* v. 88, Dec. 7, '44, pp. 100-102.

Economy of materials and over-all performance determine whether a cutter should be of the solid or inserted-tooth type.

20-469. **Master Plate Controlled Machine Speedily Bores Dividing Head Holes.** *American Machinist,* v. 88, Dec. 7, '44, p. 103.

Machine has an Ex-Cell-O high-speed precision boring head which is used both in drilling—at 2500 r.p.m.

—and in boring—at 5200 r.p.m.—the index plate for a hypoid universal spiral bevel gear dividing head.

20-470. **Carbide-Tipped Face Mills Best With 10-deg. Negative Radial Rake.** F. W. Lucht. *American Machinist,* v. 88, Dec. 7, '44, pp. 106-108.

Series of tests with face mills cutting SAE 1045 steels, with hardness of 200 Brinell, prove that positive rake angles are least satisfactory in providing long, consistent cutter life.

20-471. **Practical Ideas.** *American Machinist,* v. 88, Dec. 7, '44, pp. 111-116.

Accuracy of worn micrometers restored by lapping. Salvaged worn-out milling cutters allow high speeds and feeds. Cover for heavy files removes hazard of injury. Small bearings cleaned and burnished with a draftsman's eraser. Rigid support extends life of carbide-tipped lathe tools. Indicating device checks accuracy of cutting lips of reground drills. Altering drafting furniture provides more reference space. Fixtures for machining controller ring dials. Extension reclaims short drills and simplifies drilling in difficult locations. Modified pliers for bending cotter pins. Eliminates hazard of hand injuries.

20-472. **Dressing Grinding Wheels.** W. Fay Allen. *Mechanical Engineering,* v. 66, Dec. '44, pp. 779-782.

Developments made possible by plunge form and thread grinding and the crush-dressing process.

20-473. **Large Rotating Work on Horizontal Boring Machines.** G. I. Danly. *Machinery,* v. 51, Dec. '44, pp. 162-168.

Unorthodox machine shop methods expedited naval ordnance production. Horizontal boring, drilling, and milling machines are used not only for customary operations but also for the turning, boring, and facing of surfaces large in diameter. Huge weldments must be rotated to permit the taking of a number of cuts which would ordinarily be performed on vertical boring mills.

20-474. **Negative-Rake Cutters Hollow-Drill Armor Plate.** Charles O. Herb. *Machinery,* v. 51, Dec. '44, pp. 170-173.

Armor plate had to be closely checked for hardness at intervals of about one inch through the entire thickness at a point within the solid body of the plate, and not merely along external surfaces. Cutter was developed with the carbide tips brazed to the steel body, and this proved satisfactory.

20-475. **Refrigeration of Coolants for Machine Tools.** B. S. Williams. *Machinery,* v. 51, Dec. '44, pp. 196-198.

Importance of maintaining coolants and cutting oils at a low temperature. Equipment available for the refrigeration of coolants.

20-476. **Tooling the Automatic Screw Machine, XI.** Noel Brindle. *Modern Machine Shop,* v. 17, Dec. '44, pp. 160-162, 164, 166, 168, 170, 172.

Producing long parts on a small size machine.

20-477. **Ideas from Readers.** *Modern Machine Shop,* v. 17, Dec. '44, pp. 216, 218, 220, 222, 224, 226.

Expansion arbor of simple design. Clamping small work on a large table. Perfect alignment in welded tube joint. Swinging arm for portable hand shear. Alternating-current arc welder used to demagnetize tools.

20-478. **More Planer Work in Less Time.** John E. Hyler. *Tool Egineer,* v. 14, Dec. '44, pp. 67-71.

Streamlining planer operations.

20-479. **Automatic Machines for High Production.** *Tool Engineer,* v. 14, Dec. '44, pp. 78-81.

Continental Motors develops special tooling to meet mass production schedule on aircraft-type tank engine. Unskilled employees work to close tolerances.

20-480. **Fixture Designs Simplify Operations.** *Tool Engineer,* v. 14, Dec. '44, pp. 81-82.

Norge machine shop tools for manufacture of Navy gun on standard equipment, with emphasis on the idea that an idle man costs more than an idle machine.

20-481. **Ingenious Machines Slash Man-Hours.** *Tool Engineer,* v. 14, Dec. '44, pp. 83-84.

Kaydon Engineering designs and builds machines to eliminate hand scraping on gun mount bearing surfaces, saving more than 90% of manpower required for job. Based on boring mill design, chief features are compound cross rail and precision bearings in table and base.

20-482. **Tool-Testing Lathe.** *Tool Engineer,* v. 14, Dec. '44, p. 99.

Direct drive from variable speed motor for high speed, with reduction to four lower speed ranges, and wide feed ranges, are features of this special lathe developed for experimental work by a British manufacturer.

20-483. **The Art of Metal Cutting, II.** *Machine Tool Blue Book,* v. 40, Dec. '44, pp. 199-200, 202, 204, 206, 208, 210.

Tantalum and titanium carbides as cutting materials.

20-484. **Old Machine Tools Improved by Electronic Control.** *Steel,* v. 115, Dec. 4, '44, p. 134.

Stepless-speed drive results in simplified, more accurate finishing and better working conditions.

20-485. **Lockheed Data for Carbide Milling of Ferrous and Non-Ferrous Metals.** W. H. Arata. *Automotive Industries,* v. 91, Nov. 15, '44, pp. 34, 36, 38.

Factors which apply to all types of milling completely investigated. "Hi-cycle" milling and "Hypermilling".

20-486. **Milling T-Slots with Negative-Rake Milling Cutters.** *Machinery* (London), v. 65, Nov. 2, '44, p. 488.

Details of the two cutters.

20-487. **Multi-Tool Steel Turning with Carbide-Tipped Cutters.** R. G. *Machinery* (London), v. 65, Nov. 2, '44, pp. 494-496.

Nose radius, rake and chip-breaker width.

20-488. **Bryant Symons Diamond Tool Lathes.** *Machinery* (London), v. 65, Nov. 2, '44, pp. 497-499.

Design and use.

20-489 .**Broaching versus Milling in Manufacturing Rifle Parts.** I. A. Swidlo. *Iron Age,* v. 154, Dec. 14, '44, pp. 52-58.

The details of broach tooling for a long slender part. Comparative data on milling operations to produce the same daily output are given.

20-490. **Production of the Merlin Engine.** *Machinery* (London), v. 65, Nov. 16, '44, pp. 533-537.

Application of Cincinnati Hydro-tel milling machine to machining the vane rings of the supercharger.

20-491. **High Velocity Contour Sawing.** H. J. Chamberland. *Steel,* v. 115, Dec. 18, '44, pp. 94, 96, 98, 150.

Band saws now being operated at speeds of 7000 to 10,000 ft. per min. provide increases up to 700% in cutting rate along with improved finish.

20-492. **Hole Punching Systems.**. *Steel,* v. 115, Dec. 18, '44, pp. 108, 154.

Make production of perforating die a simple assembly job. Vertical units mount to templates or direct to die sets for longer runs on sheets. Horizontal type pierces flanges, angles, and container sides.

20-493. **Multiple Hole Punching Die Quickly Assembled.** *Iron Age,* v. 154, Dec. 21, '44, pp. 48-49.

Quick assembly type hole punching system leads to the release of experienced die makers and die setters and to the use in their place of any good mechanic who can put the assembled type die into operation. Wales "CD" hole punching system utilizes a unit consisting of a punch assembly and a die assembly.

20-494. **Broaching Versus Milling in Manufacturing Rifle Parts.** I. A. Swidlo. *Iron Age,* v. 154, Dec. 21, '44, pp. 50-53.

Broach tooling and fixture design for machining a part that is finally whittled down to a thin walled shell.

20-495. **Shankless Twist Drill Introduced.** *Iron Age,* v. 154, Dec. 21, '44, pp. 59, 136.

A new style high speed steel drill with a continuous flute that is driven by a removable taper shank generally furnished with a Morse taper to fit the spindle of the operating machine or drill press.

20-496. **Selection of Precision Taps.** R. R. Williams. *Tool and Die Journal,* v. 10, Dec. '44, pp. 90-91.

Specifications by purchaser; new taps cut oversize; tap testing requirements.

20-497. **Copper Segment Blanking Die.** Alex S. Arnott. *Tool and Die Journal,* v. 10, Dec. '44, pp. 94-95.

Cutting copper segments accurately in large quantities for electrical motor armatures is solved by machining copper bars to size and stamping them out to the shape or form required with a special blanking die.

20-498. **Carbide Machining of Steels on Automatic Screw Machines.** Carl W. Blade. *Tool and Die Journal,* v. 10, Dec. '44, pp. 98-99, 126.

Speeds and feeds; horsepower; roughing cuts; cut-off tools; rake angle; tool grinding; coolant.

20-499. **Motor-Driven Positioners Simplify Operations on Gun Parts.** *American Machinist,* v. 88, Dec. 21, '44, pp. 100-101.

Fixtures designed and built by Fisher Body reduce production costs and provide added safety for both machinists and welders.

20-500. **Practical Ideas.** *American Machinist,* v. 88, Dec. 21, '44, pp. 111-116.

Lathe fixture for machining three-sided parts with one set-up. Adapter for trunnion shafts allows four cuts on one centering. Straddle micrometer insures uniformity of panel surface contacts. Fabricated nuts with square threads meet close tolerances. Cone-shaped guide provides accuracy of hole-saw enlargements. Compound angles ground on 20 tools at each set-up. Index stop speeds machining of parts on a lathe. Finished gears removed from arbor by a carriage attachment. Gage checking procedure standardized by use of layout blue. Diamond wheel-truing device speeds up grinding operations. Vise type fixture simplifies machining of small angular parts. Keys made from bar stock by swaging.

SECTION XXI

CLEANING AND FINISHING

21-1. **Precleaning with Solvent Emulsions.** C. S. Lowe, *Monthly Review,* American Electroplaters' Society, Jan. '44, pp. 29-40.

Application, types in use, laboratory testing, theoretical aspects, use of solvent emulsions.

21-2. **Infra-Red Heating.** I. J. Barber. *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 76-77, 110-116.

Process now enlarged to include in addition to baking and drying work preheating and maintaining heat during welding, heating for expansion fits, dehydrating metal products for rust prevention, dehydrating foundry molds and cores.

21-3. **The Nature of Foreign Deposits on Metal Surfaces.** P. D. Liddiard. *Metal Industry,* v. 63, no. 24, Dec. 10, '43, pp. 370-372.

Study of the physico-chemical features which influence the presence of deposits on a metal surface. An attempt has been made to approach the problem of degreasing and residue removal from a molecular angle by studying the forces which exist to retain deposits at a metal surface. These deposits have been classified on this basis and a picture of the mechanism of their removal has been formed.

21-4. **Electrolytic Polishing of Metals.** S. Wernick. *Metal Industry,* v. 63, no. 24, Dec. 10, '43, pp. 377-380.

Theory, industrial applications and polishing of aluminum and nickel.

21-5. **Electrolytic Polishing.** S. Wernick. *Automobile Engineer,* v. 33, no. 444, Dec. '43, pp. 549-550.

A novel method of finishing metal surfaces.

21-6. **Deburring Metal Parts in Bulk.** Robert Sizelove. *Metal Finishing,* v. 34, no. 1, Jan. '44, pp. 16-17.

5 methods for deburring; each deburring job should be individually engineered to determine type and speed of barrel, medium, ratio of medium to work. These factors determine type of finish obtained.

21-7. **Technical Developments of 1943.** Nathaniel Hall and G. B Hogaboom, Jr. *Metal Finishing,* v. 34, no. 1, Jan. '44, pp. 1-9.

Developments in anodizing and corrosion prevention, polishing, cleaning, pickling, coatings, coloring, electroforming, testing and control with a bibliography of 251 items.

21-8. **Suggestions for Selection of Buffing and Polishing Wheels.** Gerald A. Lux. *Metal Finishing,* v. 34, no. 1, Jan. '44, pp. 12-13, 41.

Definition and limitations of polishing and buffing; importance of wheel dimensions and shape; Chart: Comparison of wheel speeds.

21-9. **Decorating Sheet Metal by Lithography.** Stanley T. Dingman. *Metal Finishing,* v. 34, no. 1, Jan. '44, pp. 53-55.

Review of the history and accomplishments of the art of printing of metals.

21-10. **Ford Tumbles Aircraft Engine Parts.** *American Machinist,* v. 87, no. 26, Dec. 23, '43, pp. 90-92.

Used to conserve labor and increase quality. The work compartment is filled 2/3 full with stone, pumice and water. Barrel speed is 500 r.p.m.

21-11. **Coil and Armature Drying with Improved Handling and Baking Methods.** *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 92, 94, 97, 98, 100.

3 Despatch coil-and-armature baking ovens mounted together as a battery face a varnish-tank booth which is fully enclosed. Between varnish booth and ovens there is an open area 18 ft. across.

21-12. **Simple Method for Etching Metals.** *Iron Age,* v. 153, no. 2, Jan. 13, '43, p. 57.

Cheap and simple method of etching. Method is rapid and simple to operate and gives good results on hard or stainless alloys. Process is electrolytic and makes use of a standard waxed paper stencil on which is typed or printed the required words or designs.

21-13. **Deburring Aluminum and Light Steel Parts.** G. O. Rowland. *Iron Age,* v. 153, no. 4, Jan. 27, '44, p. 65.

Removing burrs from slots, etc. Relation between fatigue and surface finish.

21-14. **How Much Pressure for Metal Cleaning Machines.** H. M. Sadwith. *Steel,* v. 114, no. 5, Jan. 31, '44, pp. 94, 115.

To determine the most efficient pressure and orifice size, the following factors are considered: Soil to be removed; shape of part; temperature used; detergent used; hardness of local water supply; and distance from spray to work.

21-15. **Removing Oil and Grease from Metal Parts.** *Canadian Mining & Metallurgical Bulletin,* no. 381, Jan. '44, pp. 45-48.

The four methods commonly used to remove oil and grease from metal parts are: Use of low flash-point solvents such as gasoline and naphtha; use of alkaline compounds which exert a saponifying or emulsifying action on the grease or oil; baking in metal ovens or enclosures; use of liquids which exert a solvent action similar to gasoline, but which are less flammable.

21-16. **Brushing Wheels Solve Many Metal-Finishing Problems.** R. O. Peterson. *American Machinist,* v. 88, no. 3, Feb. 3, '44, pp. 97-98.

Selection of brushing wheels made after compiling information on: 1. What is to be accomplished? 2. What kind of equipment is available? 3. What are the

properties of the material involved, especially hardness? 4. At what rate and under what conditions must the work be done?

21-17. **Cleaning Metallic Belt Links.** *Steel,* v. 114, Feb. 14, '44, pp. 120-122.

Production setup used by National Stamping Co., Detroit, one of the largest link producers in the field. Latest modern equipment; a smooth yet fast flow of work; clever yet simple devices to relieve or assist purely manual work.

21-18. **Metal Cleaning and Solvent Degreasing.** Edward Engel. *Metal Finishing,* v. 42, Feb. '44, pp. 80-81.

Presentation of a primary view to serve as a chart when considering the subject of metal cleaning and degreasing. Types of solvent degreasers are discussed together with equipment and procedures of metal cleaning.

21-19. **Production of Multi-Colored Effects on Anodized Aluminum.** V. F. Henley. *Metal Finishing,* v. 42, Feb. '44, pp. 82-85.

Description of the processes which have proved suitable for the production of multi-colored finishes on anodized aluminum, namely: mottled colors, double anodizing, stopping-off by offset printing, stopping-off by silk screen process, and photographic processes. 22 patents; 2 references.

21-20. **Munitions Bring Up Questions, Too.** Jeffrey R. Stewart. *Products Finishing,* v. 8, Feb. '44, pp. 30-34.

Flame priming, coating by the electric spray method, fire-retardent paints, film thickness, and painted vs. unpainted aircraft discussed by the author. Questions and answers.

21-21. **Infra-Red Paint Drying by Gas.** *Machinery (London),* v. 64, Jan. 6, '44, pp. 14-18.

Experiments which show that gas has an important part to play in the development of high rates of heat transfer by the use of infra-red.

21-22. **Oxide Black Finishes on Steel.** Jerome Black. *American Electroplaters' Society Monthly Review,* v. 31, no. 2, Feb. '44, pp. 131-140.

Depending on the exact formula used, 7¼ to 8 lb. of salts are required for each gal. final solution for a boiling temperature of 295 to 298° F. The boiling temperature is an exact indication of the amount of salts in the solution. The solutions must always be used at the boiling point to secure uniform results. The boiling point changes due to evaporation of water only and may be corrected if too high by the addition of water. If too low, salts may be added or the solution allowed to boil until the temperature rises to the desired point. Racking of work is sometimes a problem as is the processing of large bulky pieces which may have a tendency to lower the temperature when immersed.

21-23. **Industrial Dryers and Drying Systems: I.** A. W. Ferre. *Industrial Heating,* v. 11, Feb. '44, pp. 262, 264, 267, 268, 270, 272.

Discussion of the fundamentals of drying by evaporation at atmospheric pressure; presentation of the principles involved; and illustrated descriptions of the typical dryer installations.

21-24. **Infra-Red Drying with Gas.** *Steel Processing,* v. 30, Feb. '44, pp. 109-110.

Application of heat by infra-red rays in paint drying, baking, preheating and other industrial processing operations.

21-25. **Cleaning Metallic Cartride Belt Links After Stamping and Forming.** *Steel Processing,* v. 30, Feb. '44, pp. 98-100.

Description of the operation of the shot blast cleaning function in the productive set-up used by National Stamping Co., Detroit.

21-26. **Finishing for Utility.** C. M. Moore. *Die Casting,* v. 2, Feb. '44, pp. 37-39.

Kinds of finishes and methods of finishing determined by die casting alloy and the purpose of the finished part. Practices at the Link Aviation Devices, Inc.

21-27. **Finish-O-Phobia.** Paul O. Blackmore. *Die Casting,* v. 2, Feb. '44, pp. 25-28.

Flexibility of finish; methods of application of finish.

21-28. **Shot Blasting.** H. H. Clark. *Steel,* v. 114, Feb. 28, '44, pp. 100, 102, 137.

Prolongs life of leaf, torsion and helical springs.

21-29. **Protective Coating and Camouflaging.** Emerson D. Lapsley. *Automotive and Aviation Industries,* v. 90, March 1, '44, pp. 19, 72-76.

Cleaning and plating operations for protective coatings on fighter plane parts.

21-30. **Infra-red Heating.** *Aircraft Production,* v. 6, Feb. '44, pp. 101-102.

Application to the drying of large aircraft assemblies.

21-31. **Surface Finish.** W. E. R. Clay. *Institution of Automobile Engineers Journal,* v. 12, Feb. '44, pp. 9-23.

General remarks on surface finish measurements and analysis. Equipment (photograph of "Talysurf"). Surface standards and standardization. Manufacture of standard test pieces. The effect of surface finish improvement.

21-32. **The Nature of Foreign Deposits on Metal Surfaces.** P. D. Liddiard. *Metal Finishing,* v. 42, March '44, pp. 145-147, 166-167.

Deposits in the solid, liquid and gaseous phases, adsorbed layers, kinetic considerations, diagrammatic representation, removal of solids, liquids, and gases.

21-33. **How to Use Triclorethylene Solvents.** Herbert H. Hines. *Iron Age,* v. 153, March 9, '44, pp. 61-64.

Solvent types of cleaning equipment, their use and maintenance. Proper utilization gives superior cleaning at less cost, with dangers inherent in handling this chemical reduced to a minimum.

21-34. **Shot Blasting Gears to Improve Fatigue Life.** *Iron Age,* v. 153, March 16, '44, p. 63.

Surface peening by means of shot. A cleverly devised fixture which exposes all wear portions of the gear

teeth to direct and right-angled blast in a closed chamber.

21-35. **Gas Pickling and Coating of Cold-Rolled Strip.** R. F. Renkin. *Steel,* v. 114, March 27, '44, pp. 102-104.

Pickling steel strip of rimming quality or wire in a mixture of neutral flue gas and hydrogen chloride gas leaves the surface free from blisters and improves adherence of coating.

21-36. **Submerged Heating Speeds Pickling.** Thomas E. Lloyd. *Iron Age,* v. 153, March 23, '44, pp. 57-60.

The use of submerged combustion burners for heating pickling tanks has resulted in savings of time, acid and equipment, as well as better working conditions in steel mill pickling departments, according to a survey of users of this equipment.

21-37. **Industrial Dryers and Drying Systems; II.** A. W. Ferre. *Industrial Heating,* v. 11, March '44, pp. 428, 430, 433.

The fundamentals of drying by evaporation at atmospheric pressure. The principles involved, and descriptions of typical dryer installations.

21-38. **Aluminum Cleaning Methods.** Arthur S. Kohler. *Welding Engineer,* v. 29, March '44, pp. 46-48.

The spur of wartime necessity has developed effective new techniques for speeding aluminum spot welding. Of these, improved chemical cleaning techniques have probably contributed as much as anything else to reduce the frequency of spot welding engineers' headaches.

21-39. **Electrolytic Polishing of Metals.** S. Wernick *Canadian Metals and Metallurgical Industries,* v. 7, March '44, pp. 29-32, 37.

Industrial application to stainless steel, nickel and aluminum.

21-40. **Suggestions for Selection of Buffing Wheels.** Gerald A. Lux. *Metal Finishing,* v. 42, April 44, pp. 203-207.

Materials used in buffing wheels, full disc buffs, sewed full disc buffs, applications of various full disc buff sewings, spiral sewing, concentric sewing, square sewing, special sewings, sewed pieced buffs, special construction buffs.

21-41. **Coatings for Steel Cartridge Cases.** R. A. Brenneck and R. L. Norum. *Metal Finishing,* v. 42, April '44, pp. 245-247.

Cleaning shells, dip application, baking procedure, spray application.

21-42. **Some Timely Pointers on Metal Finishing.** F. R. Boynton. *Industrial Finishing,* v. 20, March '44, pp. 50, 52, 54, 59.

Diversified finishing and finishing materials. Prime coat; adhesion and permeability. Some things that counteract adhesion. Technique of correct spraying. Sanding surfacer; knifing putty. When your enamel doesn't dry properly. Wrinkle finish and how to use it.

21-43. **Postwar Indications.** R. J. Fairburn. *Industrial Finishing,* v. 20, March, '44, pp. 60, 62.

Changes that are being planned in product finishing;

what they mean to you, your organization, your customers and your future competition.

21-44. **"Near Infrared" Cuts Bake-Dry-Preheat Time.** Paul H. Krupp. *Aviation,* v. 43, April '44, pp. 153-154, 239-240.

Requiring only minutes where hours once were needed, this heat-job process is saving thousands of war-time man-hours.

21-45. **Cleaning Small, Delicate Parts.** Martin Steinhardt. *Steel,* v. 114, April 17, '44, pp. 120, 123.

Accomplished mechanically and at high speed.

21-46. **Operation and Possibilities of Gas Pickling of Steel.** J. J. Turin. *Iron Age,* v. 153, April 20, '44, pp. 64-70.

This process has many characteristics making it readily adaptable to continuous electrogalvanizing and electrotinning lines. It obviates the necessity for disposal of spent pickling liquors. Operation is described. Photomicrographs shown to indicate the type of surface condition obtained.

21-47. **Survey of Methods for Cleaning Metals.** J. M. Bialosky. *Industrial Finishing,* v. 20, March '44, pp. 41-42, 44, 46, 48.

Solvent cleaning; degreasing self-emulsifying compounds; alkali cleaners; care of power washers; removal of scale by blast cleaning, by pickling and by different burn-off methods.

21-48. **Electronic Heat Dries Paint Coatings.** *Industrial Finishing,* v. 20, April '44, pp. 36, 38, 40, 42.

Induction heating, with high frequency electricity—which heats metal surfaces quickly, to dry paint coatings.

21-49. **Intelligent Selection of Finishing Equipment.** W. Beacham. *Industrial Finishing,* v. 20, April '44, pp. 60, 62, 64.

Buying for now or present or future, lack of foresight . . . idle machines later, more production wanted.

21-50. **Postwar Metal Cleaning.** Carl L. Jensen. *Industrial Finishing,* v. 20, April '44, pp. 66, 68, 70, 72.

A quick glance over different methods of cleaning surfaces of metal before painting. This will have to be considered in your postwar production plans.

21-51. **Cleaning Prior to Finishing.** James Rowan Ewing. *Metal Progress,* v. 45, May '44, pp. 894-895.

Introduction of synthetic organic chemicals, which are combined with distillates and solvents and applied in a water medium, to the end that one operation in a spray wash completely cleans and conditions the surface. By complete cleaning and conditioning is meant removing and rinsing off of all soils, including greases, oils, inerts, compounds, or any foreign matter, plus the passivation of the cleaned metal surface against atmospheric rust or corrosion during processing.

21-52. **Chemical Coatings on Steel.** V. M. Darsey. *Metal Progress* v. 45, May '44, pp. 895-897.

Phosphate and oxide coatings, phosphate coating for corrosion protection, phosphating as a base for paint,

phosphate coating for wear resistance, phosphate coated steel for can manufacture, phosphate coating an aid in drawing steel, phosphate coating repels molten lead, zinc coated and phosphated steel, oxide coating on steel.

21-53. **Coatings on Aluminum by Chemical Treatment.** Ralph E. Pettit. *Metal Progress*, v. 45, May '44, p. 898.

Increased use of chemical coating processes for aluminum alloys due to the lower cost of chemical treatments, as contrasted with anodic oxidation processes. The difficulty of quickly obtaining equipment for anodic treatment plants; possible difficulties in obtaining certain materials for the anodic process. Protective coatings can be produced by chemical treatment on pieces which cannot, by reason of their shape and construction, be given an anodic coating.

21-54. **Surface Treatment of Magnesium Alloys.** W. S. Loose and H. K. Delong. *Metal Progress*, v. 45, May '44, pp. 899-900, 924.

Chrome-pickle treatment, dichromate treatment, sealed chrome-pickle treatment.

21-55. **What's Ahead in Finishing?** *American Machinist*, v. 88, April 27, '44, pp. 89-96.

Postwar production will benefit by war development. How finishing will be affected.

21-56. **Improved Cleaning of Forgings.** *Steel*, v. 114, May 1, '44, pp. 112, 114.

High production conveyorized systems for cleaning aluminum forgings.

21-57. **Synchronizing Ovens with Spray Booths.** C. A. Litzler. *Products Finishing*, v. 8, April '44, pp. 24-26, 28, 30, 32, 34, 36.

Four-zone conveyor oven has ventilation zone for dust-free operation on ordnance materials.

21-58. **Equipment for Pickling.** John E. Hyler. *Products Finishing*, v. 8, April '44, pp. 64, 66.

Pickling machines of rotary design.

21-59. **Gas Pickling of Steel.** *Ceramic Industry*, v. 42, May '44, pp. 50-53.

Because of the war, the gas pickling process has been applied commercially only to galvanizing. But it is believed that in the post-war period the process is capable of making valuable contributions to the preparation of metals for coating. Samples prepared for enameling have demonstrated superior results.

21-60. **Suggestions for Preparation and Heading of Polishing Wheels with Glue.** Gerald A. Lux. *Metal Finishing*, v. 42, May '44, pp. 264-266, 269.

Preparation of polishing wheels for heading, glue for heading polishing wheels, heading of polishing wheels, drying of wheel heads, breaking up or cracking wheel heads, balancing polishing wheels.

21-61. **Recovery of Free Acid from Pickling Liquors.** Harry W. Gehm. *Metal Finishing*, v. 42, May '44, pp. 270-271.

Acetone has been found superior to solvents previously tried for promoting the crystallization of cop-

peras from pickling liquor. While not satisfactory for the treatment of continuous-process liquor, batch liquor responds well from the standpoints of ferrous sulfate removal, acid concentration, quality of separated copperas, and acetone separation. A system for applying this process without appreciable acetone loss may be of practical value. 2 ref.

21-62. **Durability Characteristics of Lustreless Enamels.** S. E. Beck. *Metal Finishing,* v. 42, May '44, pp. 307-308, 310, 316.

Durability of lustreless enamels, the various factors involved, etc. Contains much information which will provide a background and appreciation for these materials. 9 ref.

21-63. **Electrophoretic Finishing.** Edward J. Roehl. *Metal Finishing,* v. 42, May '44, pp. 313-316.

Electrophoretic plating of rubber, waxes, natural and synthetic resins, graphite, carbonates, oxides and metals, cellulose, bitumin, glass and enamel, lubricants. 22 ref.

21-64. **A Proposed Method of Cleaning Ground-In Precision Ball Bearings.** W. B. Spooner. *Machinery,* v. 50, May '44, p. 157.

How to remove the final traces of abrasive since ordinary cleaning materials and methods are not designed to insure the complete removal of solid particles, particularly of such finely divided material.

21-65. **Production Painting of Cargo Trailers.** Dale Musselman. *Industrial Finishing,* v. 20, May '44, pp. 18-22.

Conveyorized line through cleaning, painting, drying; rust-inhibitive primer plus olive drab paint; water-wash spray booths—paint supply line; paint mixing room—check on viscosity; small parts production; masking; women workers.

21-66. **How to Get More out of Your Equipment.** W. Beacham. *Industrial Finishing,* v. 20, May '44, pp. 54, 59-60.

Instruct new help on how to use equipment properly, a few suggestions about care of spray equipment, an example of what manufacturers are up against, water-wash booth that doesn't need compound, thorough and regular cleaning is desirable.

21-67. **Black Oxide Finish for Stainless Steel.** Irvine C. Clingan. *Steel,* v. 114, May 22, '44, pp. 80-81.

Quickly applied with new sodium dichromate process. 2 ref.

21-68. **Industrial Dryers and Drying Systems: III.** A. W. Ferre. *Industrial Heating,* v. 11, May '44, pp. 774, 776, 779, 780, 782, 784.

Factors involved in the selection of drying apparatus for a given application and the application of industrial drying equipment to the drying of enamel finishes, animal fur, etc.

21-69. **Side-By-Side Installation of Varnish Kettles and Baking Oven for Impregnating Transformer Coils.** *Industrial Heating,* v. 11, May '44, pp. 786-788.

The arrangement of varnish tanks beside a forced

draft baking oven at the plant of the Franklin Transformer Co., has enabled the company to maintain uninterrupted production of coils and transformers despite manpower shortages.

21-70. **Fire Protection for the Finishing Department.** William H. Easton. *Products Finishing,* v. 8, May '44, pp. 38-40, 42, 44.

Plant workers properly trained and equipped for fire fighting frequently render invaluable assistance in checking industrial fires.

21-71. **A Thought to Aluminum.** Arthur R. McNeil. American Electroplaters' Society *Monthly Review,* v. 31, May '44, pp. 434-441.

Finishing of aluminum by mechanical, chemical, electrolytic, oxide, electroplated, organic methods.

21-72. **Annotated Bibliography of Aluminum Cleaning.** Jay C. Harris and Robert B. Mears. American Society for Testing Materials *Bulletin,* No. 128, May '44, pp. 35-40.

The information which has been abstracted comprises various types of commercial cleaning methods, means for inhibiting corrosion, and descriptions of published laboratory techniques for the evaluation of metal cleaning detergents.

21-73. **Improving Zinc Chromate Primer Adhesion.** J. F. Mason. *Products Finishing,* v. 8, June '44, pp. 60-62, 64, 66.

Maximum zinc chromate primer adhesion can only be obtained by application on metal surfaces which have been cleaned thoroughly. In the case of subsequent primer or final finish coats applied over an aged detail primer coat, it is very important to abrade or scuff the hardened primer to insure a good bond. The use of aluminum wool is recommended for this operation.

21-74. **Flame-Priming for Paint Wear.** Clyde B. Clason. *Welding Engineer,* v. 29, June '44, pp. 40-43.

Many maintenance man-hours can be saved if the paint job is done right the first time. Flame-priming lifts off all loosely bonded scale, dehydrates rust, provides a hot, dry surface for application of the paint coat.

21-75. **Finishing Scout Cars and Tank Destroyers.** Gordon Robertson. *Metal Finishing,* v. 42, June '44, pp. 385-386.

Finishing operations on the scout cars and tank destroyers have been developed to a high degree of specialization and mechanization. From the time that stamped, machined, forged or cast parts leave the machine area until the time they arrive at the proper storage area adjoining the main assembly line they are handled, cleaned and finished by conveyor. Three distinct major finishing systems. First, there is the chassis line which is actually the final assembly line. Frames are riveted together and mounted on an endless chain traveling at floor level. The chassis moves along, picking up engine, transmission, etc., until it is complete except for the body. It then enters the paint spraying

chambers which are open at both ends and equipped with water wash curtains lining both walls. As it passes through the booth, the chassis is given a finish coat of lustreless olive drab specification enamel.

21-76. **The Industrial Pickling of Metals.** P. D. Liddiard. *Chemical Age,* v. 50, May 6, '44, pp. 435-438.

Theory and the practice. 4 ref.

21-77. **The Finishing of Light Alloys.** *Chemical Age,* v. 50, May 6, '44, pp. 440-441.

A factor affecting post-war utility.

21-78. **Cleaning and Descaling Steel by Electrolytic Pickling in Molten Caustic Soda.** N. L. Evans. Iron & Steel Institute Advance Copy, April '44, 23 pp.

Electrolytic treatment in molten caustic soda imparts to the steel a mild degree of resistance to rusting, and hydrogen is not absorbed. Finding the optimum conditions of time, temperature and current density, and the occurrence and prevention of brown stains on the work. Certain electrical conditions in the plant have been investigated, and their bearing on plant design is discussed.

21-79. **New Method Developed for Processing Wire & Strip in Molten Glass.** J. J. Caugherty. *Steel,* v. 114, June 19, '44, pp. 102-104, 106.

New procedure for cleaning ferrous metal coated with lead includes heating the material to oxidize the lead coating and form lead oxide, coating the piece with glass, and cooling it so that the glass will separate and carry the lead oxide with it, thus leaving a clean surface on the steel. Process eliminates usual pickling, annealing and de-leading operations and is suitable for various grades of wire and strip steel.

21-80. **Anodic or Cathodic Electrocleaning of Steel.** Walter R. Meyer. American Electroplaters' Society *Monthly Review,* v. 31, June '4, pp. 511-514.

Anodic cleaning is preferable in almost all cases except when there are chlorinated compounds present that might cause attack on the steel.

21-81. **Abrasive-Liquid Blast Produces Hone Finish.** A. H. Eppler. *Product Engineering,* v. 15, July '44, pp. 468.

Fine abrasive suspended in a water-chemical emulsion and discharged by a spray nozzle at high velocity produces a finish comparable to that produced by honing. The process, originally intended for cleaning surfaces, is being used in numerous other applications because it is time saving and efficient in finishing surfaces.

21-82. **Barrel Finishing of Metal Parts.** R. W. Mitchell. *Metals & Alloys,* v. 19, June '44, pp. 1396-1401.

Outlines the nature and fields of application of tumbling, rolling, barrel de-burring, and burnishing of metal finishing and discusses the practical aspects of several specific problems that can be solved by one or more of these methods.

21-83. **Increasing Efficiency in Metal Finishing.** Jeffrey R. Stewart. *Products Finishing,* v. 8, July '44, pp. 30-32, 34.

Result of a literature search at the Library of Congress in Washington, D. C. intended to provide information in condensed form.

21-84. **Magnesium.** G. C. Close. *Industrial Finishing,* v. 20, July '44, pp. 30, 34, 36, 38, 40, 42.

Cleaning, surface treating and protective coating.

21-85. **War Product-Painting Management.** Red Sparks. *Industrial Finishing,* v. 20, July '44, pp. 44, 46, 48, 50.

How a painting set-up gets out more work and does it faster on same floor space.

21-86. **Industrial Dryers and Drying Systems: IV.** A. W. Ferre. *Industrial Heating,* v. 11, July '44, pp. 1126, 1131, 1134, 1136, 1138, 1140-1141.

Principles involved and illustrated descriptions of typical dryer installations.

21-87. **Electrolytic Pickling.** N. L. Evans. *Iron and Steel,* v. 17, June, '44, pp. 501-505.

Cleaning and descaling steel in molten caustic soda.

21-88. **Finishing Processes Employing Abrasives.** *Metallurgia,* v. 30, May '44, pp. 13, 14.

Investigations on various metal finishing operations have been carried out in Germany in an effort to find a clear definition for such methods as lapping, honing and super-finishing, and thus to reduce misinterpretation. 4 ref.

21-89. **Cleaning Aircraft Parts.** *Iron Age,* v. 154, July 27, '44, pp. 54, 55.

Procedures used in sand blasting, degreasing and alkaline cleaning. Economical plant installations and the limitations of each cleaning and precleaning method.

21-90. **Superfinishing.** W. E. R. Clay. *Machinery* (London), v. 65, July 6, '44, pp. 13-16.

Characteristics, wear reduction, load-carrying capacity increased, surface-measuring equipment.

21-91. **Stainless Steel and Magnesium Pickling.** *Iron Age,* v. 154, August 3, '44, pp. 59, 138.

Special pickling problems arising from the individual characteristics of stainless steel and magnesium. Operational sequences and unit installations described.

21-92. **Reclamation of Electrical Insulating Varnish.** D. L. Gibson and C. H. Braithwaite. *Iron Age,* v. 154, August 3, '44, pp. 68-69.

A portable type pressure filter is used periodically to restore the used shop varnish to a state equal to that of new varnish.

21-93. **The Coloration of Stainless Steels.** Clements Batcheller. *Metal Finishing,* v. 42, August '44, pp. 466-469, 474.

First commercially developed process for the surface treatment of the simple and complex groups of ferrous alloys.

21-94. **Annotated Bibliography of Aluminum Cleaning.** Jay C. Harris and Robert B. Mears. *Metal Finishing,* v. 42, August '44, pp. 475-479, 495.

Brings bibliography up to date. Includes abstracts of Federal specifications relating to metal cleaning.

21-95. **Finishing Soldiers' Helmets.** Frank V. Faulhaber. *Metal Finishing,* v. 42, August '44, pp. 511-514.

Pickling points; temperature uniformity; uniform consistency; care and conservation; painting procedure; maintaining equipment; infra-red drying; no pre-heating; less fire hazard.

21-96. **Baking Shell Cases with Infra-Red.** *Metal Finishing,* v. 42, August '44, pp. 516-517.

Process can be used with overhead or flat conveyors for either dip or spray finishing.

21-97. **Methods and Standards for Gloss Measurement of Camouflage Materials.** Richard S. Hunter. *Metal Finishing,* v. 42, August '44, pp. 519-522.

The sources of discrepancy in gloss measurements and the recommendations made for obtaining satisfactory agreement. 10 ref.

21-98. **Fundamentals of Cleaning Die Castings.** R. W. Mitchell. *Die Casting,* v. 2, August '44, pp. 74-80.

Reasons for, and a general outline of methods. Cleaning before buffing, deburring, burnishing, plating, painting, lacquering.

21-99. **Cleaning Aircraft Parts.** Temple Davis. *Welding Engineer,* v. 29, August '44, pp. 38-40.

The results of Douglas Aircraft's experiments and production experience in preparing aluminum alloy sheets for welding.

21-100. **The Composition of Buffing Compounds.** Henry R. Power. *Products Finishing,* v. 8, August '44, pp. 38, 40, 42.

Action; ingredients; cleaning.

21-101. **Increasing Efficiency in Metal Finishing. II.** Jeffrey R. Stewart. *Products Finishing,* v. 8, August '44, pp. 66, 68, 70.

Primers for aircraft; comparison of primers for steel; adhesion of protective coatings; heat proof coatings; corrosion resistant tests.

21-102. **Magnesium.** G. C. Close. *Industrial Finishing,* v. 20, August '44, pp. 38, 42, 44, 49-50, 55.

Cleaning, surface treating and protective coating of magnesium.

21-103. **Accelerated Sulphuric Acid Anodizing.** G. V. Akimoff, N. D. Tomashoff and M. N. Tukina. *Light Metals,* v. 7, July '44, pp. 311-319.

Advantages of the sulphuric-acid process summarized. Investigations to determine the possibility of further improvements. 5 ref.

21-104. **An Electro-Chemical Descaling Process.** *Metallurgia,* v. 30, June '44, p. 76.

A continuous and non-porous metal film, usually tin, electrodeposited on the work simultaneously with the scale and oxide removal, completely protects the work surface from pitting and etching. This metal film can be removed easily and completely.

21-105. **Cleaning and Descaling Steel by Electrolytic Pickling in Molton Caustic Soda.** N. L. Evans. *Metallurgia,* v. 30, June '44, pp. 97-99.

Investigation is concerned with finding the optimum conditions of time, temperature and current density, and with the occurrence and prevention of brown stains on the work. Certain electrical conditions in the plant have been investigated, and their bearing on plant design discussed.

21-106. **Fatigue Life of Stressed Parts Increased by Shot Peening.** D. C. Turnbull. *American Machinist,* v. 88, August 31, '44, pp. 83-86.

An outgrowth of a cleaning process, shot peening is used to add service life to many types of products. Tests and experiments show how to get best results.

21-107. **Effective Cleanser for Aluminum Prior to Spot Welding.** T. E. Piper. *Metal Progress,* v. 46, Sept. '44, p. 485.

A one-step cleaning and etch method, applicable to assemblies of details, jigged and held together temporarily by fasteners of various sorts.

21-108. **Short Cycle Anodizing.** George Maynard and A. A. Baudat. *Metal Progress,* v. 46, Sept. '44, pp. 485-486.

Short anodizing process for aluminum and its alloys containing less than 5% copper. Coupled with a solution control method, it gives a slightly better anodic film than the process in general use.

21-109. **Shot for Metal Peening.** Oscar E. Harder and James T. Gow. American Society for Metals. 1944 Preprint No. 32, 9 pp.

Heat treated shot is subjected to heating to decompose the massive carbides and cooled to produce diferent hardnesses in the range of 200 to over 500 Brinell equivalent, or quenched to a martensitic structure and tempered to a desired hardness. Typical chemical compositions and hardness values given, and photomicrographs illustrative of the various materials included.

21-110. **Pickling.** Frank Taylor. *Iron and Steel,* v. 17, July '44, pp. 525-527.

Evolution of the modern descaler for ferrous bases.

21-111. **The Surface Treatment of Alclad 24S-T Prior to Spot Welding.** W. F. Hess, R. A. Wyant, and B. L. Averbach. *Welding Journal,* v. 23, August '44, pp. 402-s-413-s.

Chemical treatment can produce low and consistent surface resistances on nitrate-treated Alcald 24S-T for spot welding, provided the surfaces have been properly pre-cleaned and are free from baked-in oil or grease. Several solutions of effective oxide removers cited. 4 ref.

21-112. **Continuous Straight Line Operation.** Gerald Eldridge Stedman. *Metal Finishing,* v. 42, Sept. '44, pp. 539-542.

Equipment and details of the cleaning process.

21-113. **Semi-Continuous Pickling of Strip.** C. F. Buente. *Metal Finishing,* v. 42, Sept. '44, pp. 543-544, 546.

A small counter current applied between a zinc anode (as cathode) and a steel plate in the bath (as anode) is highly effective in eliminating chemical attack of the zinc.

21-114. **Electropolishing.** Charles L. Faust. American Electroplaters Society *Monthly Review,* v. 31, Sept. '44, pp. 807-815.

Finishing for appearance; methods; corrosion protection by electropolishing; electropolishing for reasons other than for appearance; electropolishing for finishing before plating.

21-115. **Finishing Padlocks.** *Die Casting,* v. 2, Sept. '44, pp. 69, 72, 74.

Care exercised in preparing surfaces, as well as in applying non-metallic finishes and baking, insures enduring coatings in "Yale" die cast products.

21-116. **Finishing Metal Containers for .75 Millimeter Shells.** J. E. Sump. *Products Finishing,* v. 8, Sept. '44, pp. 24-26, 28.

After cleaning and bonderizing, the containers are dried off by conveying through the 13-ft. long drying-off oven, illustrated.

21-117. **Increasing Efficiency in Metal Finishing. III.** Jeffrey R. Stewart. *Products Finishing,* v. 8, Sept. '44, pp. 54-56, 58, 60.

Use of sealing compounds based on synthetic resins. Blackening stainless steel; Azo pigment dyes; heating metal prior to painting.

21-118. **The Finishing Room Grows Up.** Bryant W. Pocock. *Products Finishing,* v. 8, Sept. '44, pp. 62, 64, 66, 68, 70.

Increased production; probable goals; laboratory control; safety; recovery of paint.

21-119. **Survey of Chemically Cleaning Aluminum Alloys for Spot-Welding.** F. M. Morris. American Welding Society Preprint, Oct. '44.

Survey of 50 aircraft companies; questionnaire pertained to materials for pre-cleaning and oxide removal and methods of procedure, control of solution strength, and production spot welding results. Summary of the answers.

21-120. **Paint Drying with Infra-Red Radiant Gas Burners.** Wm. H. Tesmer. *Industrial Heating,* v. 11, Sept. '44, pp. 1482, 1487-1488, 1490.

The gas-fired refractory type infra-red burner, when employed with a recirculating system as in paint drying will offer decided advantages, such as markedly reduced fuel costs, and will equal or better speed of production as compared with lamps; and provides up to 300% increase in production as compared with indirect-gas-fired equipment, without reformulation of paint.

21-121. **Electrolytic Pickling of Steel in Molten Caustic Soda.** *Industrial Heating,* v. 11, Sept. '44, p. 1492.

Produces a highly satisfactory surface for subsequent operations such as plating, galvanizing, tinning, vitreous enameling, painting. It imparts to the steel a mild

degree of resistance to rusting, and hydrogen is not absorbed as in certain other scale-removal methods. Metallic losses are minimized and consumption of chemical is low.

21-122. **Synthetic Rubber Has Long Life In Blast-Cleaning Service.** H. E. Linsley. *American Machinist,* v. 88, Sept. 28, '44, pp. 112-114.

Rubber used in rotating blades, protective curtains and masks improves life of cleaning units used on Cyclone engine cylinders and conserves critical abrasive.

21-123. **The Latest United Semi-Continuous Pickler.** C. F. Buente. *Blast Furnace & Steel Plant,* v. 32, Sept. '44, pp. 1068-1070.

Description and advantages of method.

21-124. **What to Consider When Choosing the Right Metal Cleaner.** G. C. Close. *Industrial Finishing,* v. 20, Sept. '44, pp. 34, 36, 38.

Characteristics of liquid metal cleaners.

21-125. **Semicontinuous Strip Pickler Handles Individual Coils.** C. F. Buente. *Steel,* v. 115, Sept. 25, '44, pp. 90, 92.

Elimination of welder or stitcher, looping pits and shear usually found in continuous lines reduces floor space required and minimizes installation, operation and maintenance costs. Quick pickling action secured by immersing the piece in a hot water bath at the front end of line to remove particles of scale and increase temperature of strip.

21-126. **Factory Preweld Cleaning of 24-ST Alclad and 61-SW Aluminum Alloys with Hydrofluosilicic Acid Solution.** G. W. Scott, R. V. Ingram and A. A. Burr. *Welding Journal,* v. 23, Sept. '44, pp. 443-s-453-s.

Preweld cleaning solution for 24-ST Alclad aluminum alloys, consisting of a dilute solution of hydrofluosilicic acid, H_2SiF_6, to which a trace of a wetting agent is added.

21-127. **Surface Finish and the Function of Parts.** G. Schlesinger. Institution of Mechanical Engineers *Journal,* v. 151, Sept. '44, pp. 153-165.

Given good design, a machine will work properly when the material, the fits and tolerances, and the quality of the surfaces are chosen to suit the working conditions. Examples.

21-128. **Distinctive Symbol Adopted to Designate Surface Finish.** James A. Broadston. *Product Engineering,* v. 15, Oct. '44, pp. 704-706.

Details of a method for indicating on drawings the allowable surface roughnesses on parts. Simple shop inspection tools for making a rapid determination of whether the surfaces fall within allowable roughness limits are reviewed.

21-129. **A Surface Finish for Magnesium Alloys.** N. H. Simpson and Paul R. Cutter. *Iron Age,* v. 154, Oct. 5, '44, pp. 54-58.

A finishing process which comes close to being ideal for magnesium alloys. Two coats of paint are sufficient for proper insulation, and high resistance to corrosion

and abrasion and the decorative value of the finish could well have many post-war applications. The chemicals used are inexpensive, and the electrical equipment is not elaborate.

21-130. **Precleaning Low Carbon Steel for Spot Welding.** Jean Gauthier. *Iron Age,* v. 154, Oct. 5, '44, pp. 66-67.

Simple procedure for removing oil, soil and oxide from low carbon steel sheets so as to assure structurally sound welds and to prepare a surface to which paint or plating readily adheres.

21-131. **Finishing Operations at Willow Run.** Bryant W. Pocock. *Products Finishing,* v. 9, Oct. '44, pp. 32-34, 36, 38, 40, 42, 44.

The technical considerations in the finishing of metal parts.

21-132. **Petroleum Thinners and Their Significance to Metal Finishing.** Jeffrey R. Stewart. *Products Finishing,* v. 9, Oct. '44, pp. 46, 48, 50, 52, 54, 58, 60.

Methods for evaluating petroleum thinners; the correct method for determining solvent power.

21-133. **Care and Correct Use in Automatic Spray Finishing.** Frank V. Faulhaber. *Products Finishing,* v. 9, Oct. '44, pp. 76-78, 80, 82, 84, 86.

Automatic spraying permits economizing of floor space, by itself, but the equipment should also be so arranged as to coordinate efficiently with other necessary finishing processes and operations.

21-134. **Polishing and Buffing Die Castings.** L. Ralph Eastman. *Die Casting,* v. 2, Oct. '44, pp. 82, 84, 86.

The materials and methods to be employed in finishing die castings depend on the type of metal, the condition of the surface as the parts reach the polishing and buffing department, and the type and quality of finish required; also, to some extent, on the volume of production, which determines whether hand or automatic equipment is to be employed.

21-135. **Cleaninghouse Practice.** F P. Spruance. *Wire & Wire Products,* v. 19, Oct. '44, pp. 671-675, 678-679.

Inhibitors are being generally used in the pickling of rods and wire, both of low and high carbon and of alloys. Improved practice of copper coating has resulted in better coated wire, facilitated drawing and extended die life. While copper coatings oxidize rapidly, their resistance to corrosion may be extended by a newly developed process which, with modification, may still further improve drawing.

21-136. **Electrostatic Spraying and Detearing.** Harry Forsberg. *Iron Age,* v. 154, Oct. 19, '44, pp. 50-54.

Even complex metal parts now are painted automatically, economically, and with superior finish by spraying in an electrostatic field. Similar desirable results attend the electrostatic detearing of parts dipped in paint.

21-137. **Measuring and Designating Surface Finish.** James A. Broadston. *Iron Age,* v. 154, Oct. 19, '44, pp. 62-66.

Types of surface irregularities and standards of roughness values.

21-138. **The Principal Health Hazards in Metal Finishing Departments and Their Control.** Merril Eisenbud. *Metal Finishing,* v. 42, Oct. '44, pp. 602-605.

Alkali cleaning and finishing; pickling vats; nitrous fumes; chromic acid; cyanide plating; abrasive blasting; buffing; dermatitis; degreasing.

21-139. **Plastic Finishing of Metal Products.** Haviland F. Reves. *Metal Finishing,* v. 42, Oct. '44, pp. 647-649.

Specifications and applications.

21-140. **Centrfugal Finishing.** John E. Hyler. *Metal Finishing,* v. 42, Oct. '44, pp. 650-652.

Centrifugal enamelers.

21-141. **Wetting Agents—Their Use in Electroplating and Allied Processes.** H. Silman. Electrodepositors' Technical Society Preprint, v. 19, '44, pp. 131-146.

Soap materials employed. Sulphated fatty alcohols, aryl alkyl sulphonates, cation-active materials, petroleum derivatives. Wetting agents in cleaning solutions; electrolytic cleaners; foaming; testing of cleaners; pickling processes; inhibitors; dragout; spot-welding of light alloys; electrodeposition; bright nickel deposits; tin plating; soldering. 17 ref.

21-142. **Electrostatic Air Cleaning Safeguards Weirton's Electrical Equipment.** *Steel,* v. 115, Oct. 23, '44, pp. 86, 88.

Maintenance work on prime movers is reduced one-half and their life increased considerably by cooling with cleaned air. Bank of cells now employed to supply clean air to electrical units serving electrolytic tinning lines are relieved of entrapped dirt by automatic washer.

21-143. **Cleaning and Descaling Steel by Electrolytic Pickling in Molten Caustic Soda.** N. L. Evans. The Iron and Steel Institute April '44. *Engineers' Digest,* v. 1, Sept. '44, pp. 568-570.

Cell installation preliminary work to establish broad principles of operation; scheme of work; efficiency of descaling; removal of sponge iron after descaling; investigation of causes of brown stain.

21-144. **Plastic Coatings for Metals.** Charles Delmar Townsend. *Iron Age,* v. 154, Nov. 2, '44, pp. 56-57.

Use of synthetic coatings for newly developed plastic materials will improve the surface of the metal considerably, will cut finishing costs, and will increase the salability and market value of the product.

21-145. **Measuring and Designating Surface Finish.** James A. Broadston. *Iron Age,* v. 154, Nov. 2, '44, pp. 58-62.

Methods of comparing surface finishes, including a description of a new low cost comparison roughness gage made of plastic, which promotes surface quality control not only in the plant machine shop but also among parts suppliers scattered over wide areas.

21-146. **Polishing and Buffing Die Castings.** L. Ralph Eastman. *Die Casting,* v. 2, Nov. '44, pp. 67-68.

Plant layout; selection of type of buff and wheel speed.

21-147. **Surface Finish—Key to Bearing Life.** E. L. Hemingway. *Machine Design,* v. 16, Nov. '44, pp. 123-128.

Cross-direction, closely spaced, fine scratches increase load capacity. Welds formed on such surfaces should be restricted in size, and should immediately be detached just like chips in an intermittent cut on an engine lathe. It has been determined that such surfaces form a glaze more rapidly than others of the same scratch depth.

21-148. **Superfinish—To Date.** M. W. Petrie. *Tool Engineer,* v. 14, Nov. '44, pp. 86-87.

Cutting tools, as well as other small parts, are added to the list of superfinished products. One result of increasing application is a growing emphasis on the need for finish measurement standards.

21-149. **The Size Characteristic of Polishing Abrasives.** Henry R. Power. *Products Finishing,* v. 9, Nov. '44, pp. 66-68.

The importance of size uniformity for polishing grains.

21-150. **Modern Metal Cleaning Processes.** *Metal Treatment,* v. 11, Autumn '44, pp. 179-188.

Cleaning problems encountered in every-day production.

21-151. **Reclamation of Bearings.** Hudson T. Morton. *Aero Digest,* v. 47, Nov. 15, '44, pp. 119-120, 126, 128, 130.

Cleaning methods; avoiding corrosion; drying parts; bearing inspection.

21-152. **Organic Finishes for Magnesium.** Gilbert C. Close. *Light Metal Age,* v. 2, Nov. '44, pp. 20-22.

Requirements of primer and finished coatings. Pre-analysis concerning the product's application before deciding the coating requirements.

21-153. **Electrolytic Polishing.** S. Wernick. *Steel,* v. 115, Dec. 11, '44, pp. 146, 148, 176, 178, 180.

Favorable for treatment of practically every common metal, especially stainless steel. Copper, nickel, aluminum, zinc, tin, lead and brass indicate more or less promising possibilities for further development.

21-154. **Measuring Methods Described for Surface Roughness Specification.** James A. Broadston. *Product Engineering,* v. 15, Dec. '44, pp. 806-810.

Measuring and specifying surface roughness to point the way toward standardization of such procedures. Taper-sectioning technique described along with methods for establishing defined standards through use of an Amsler Integrator, and ways of determining RMS micro-inch values from Brush Analyser record tapes. 9 ref.

21-155. **Convection Vs. Radiant Curing of Industrial Finishes.** Charles C. Eeles. *Industrial Gas,* v. 23, Dec. '44, pp. 18-19, 28-31.

Drying of metal finishes by radiation and by convec-

tion with particular attention to the relative speeds with which the cure may be completed.

21-156. **How Cadillac Uses Production Shot Peening.** R. L. Orth. *Steel,* v. 115, Dec. 18, '44, pp. 89, 131.

Shot peening important for the improvement of the physical properties of steel and metal parts. With the shot peening process, shot is driven against the surface of the parts to be treated by means of an air blast or the rotating blades of a wheel, thereby cold working the metal at or near the surface and thus considerably increasing its fatigue strength and resistance to surface damage, pitting corrosion and decarburization. The process is advantageous for use in treating irregular shapes which cannot be readily heat treated without danger of distortion or cold worked by rolling or drawing. Cadillac's use of process described.

21-157. **Suggestions for Selection of Polishing Wheels.** G. A. Lux. *Metal Finishing,* v. 42, Dec. '44, pp. 739-742.

Various types of commercial polishing wheels, the materials from which they are constructed, their special characteristics, and some of the types of polishing operations in which they find application.

21-158. **Testing and Evaluating Finishes at Lockheed.** S. G. Andrews. *Metal Finishing,* v. 42, Dec. '44, pp. 780, 782.

Program of testing and study at Lockheed. Different methods of application were tried and various conditions under which tests were made taken into consideration.

21-159. **Cleaning Air Compressors and Air Receivers.** *Metal Finishing,* v. 42, Dec. '44, pp. 784-785.

Safe procedure. Hazards.

21-160. **Semi-Automatic Spray Set-Up Speeds Finishing.** *Die Casting,* v. 2, Dec. '44, pp. 64, 66.

Machine for spraying end bells; rotating disk carries the parts to be finished between the two spray guns. Parts sprayed are die castings or a combination of die cast and stamped elements. Loading and unloading done by hand.

21-161. **Finishing Aluminum With Paint Coatings.** Robert I. Wray. *Industrial Finishing,* v. 21, Dec. '44, pp. 24-26, 28, 30, 32, 34.

Cleaning and proper treatment of aluminum surfaces previous to painting or finishing. 4 ref.

SECTION XXII

WELDING, BRAZING AND FLAME CUTTING

22-1. **Tool Reclamation.** *Aircraft Production,* v. 5, no. 62, Dec. '43, p. 598.

A new process for tipping tools.

22-2. **Heavy-Gauge Spot Welding.** F. C. Dowding. *Aircraft Production,* v. 5, no. 62, Dec. '43, pp. 563-565.

On light alloy aircraft. Difficulties, technique, electrode details, cleaning.

22-3. **Refrigerated Welding Tips Save Time and Money.** *Aviation,* v. 43, no. 1, Jan. '44, p. 189.

Spot welding speeded up as much as 300 per cent by use of refrigerated electrodes.

22-4. **Spotwelding Expedites Lockheed "Constellations."** Ellis F. Gardner. *Aviation,* v. 43, no. 1, Jan. '44, pp. 161-165, 363-364.

Research program reveals both design and production advantages via technique heretofore limited almost entirely to non-structural members.

22-5. **Warehouse Turns Fabricator.** J. G. Magrath. *Welding Engineer,* v. 29, no. 1, Jan. '44, pp. 50-54.

Flame-cutting and welding over 6,000 tons of steel plate annually. Avery and Saul design and produce flame-cut and welded machine parts.

22-6. **Magnesium Spot Welding.** W. S. Loose. *Welding Engineer,* v. 29, no. 1, Jan. '44, pp. 40-44.

Weldable alloys, cleaning, equipment, pressures, electrodes, properties of welds, corrosion resistance.

22-7. **A Year of Triumph.** T. B. Jefferson. *Welding Engineer,* v. 29, no. 1, Jan. '44, pp. 35-37.

Ship repair, prefabricated shipbuilding, arc welding, electrode production, gas, chemical, resistance welding.

22-8 **Importance of Producing Welds of Specified Size.** Clayton B. Herrick. *Industry and Welding,* v. 16, no. 12, Dec. '43, pp. 33-35.

Determination of strength of weld and specifications to be set up prior to welding.

22-9. **Trapped Slag Control.** Robert Burnett. *Industry and Welding,* v. 16, no. 12, Dec. '43, pp. 27-28.

"Trapped Slag" a defect in weld metal similar to other defects. It will not fuse and it stops penetration,

crack undercutting and porosity; it reduces physical properties such as tensile strength, ductility and elongation.

22-10. **Welding Large Semi-Circular Plates.** George Pettit. *Industry and Welding,* v. 16, no. 12, Dec. '43, pp. 29-32.

The fabrication of welded steel turntables.

22-11. **Special Welding Positioners Speed Barge Construction.** *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 82, 119.

Portable, well-built fixture used for positioning end sections for maximum welding efficiency.

22-12. **High Production Flame Cutting.** Harold Lawrence. *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 58-60, 90.

Speeds fabrication. Improved procedures on one job raise man-day output from 72 to 112 pieces. Detailed technique at Lukens subsidiary plant.

22-13. **Quality Control in Production Welding.** Walter J. Brooking. *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 68-70, 72, 75.

Visual examination and quality control. Specifications, weld metal vs. parent metal, the finished weld, checking.

22-14. **Improved Technique Employed in Fabricating Large Steel Rings.** *Steel,* v. 114, no. 4, Jan. 24, '44, pp. 56-57.

First step in fabricating is to heat the steel to about 1200° F. in heating furnace, then it is formed into a ring in a ring forming press. After cooling, the ring is moved onto a welding table where the ring joint is flash welded. It then goes back into the furnace. After reheating, the ring is pulled from the furnace with a tractor and taken to a sizing ring which stretches the piece to the proper diameter.

22-15. **How to Use Resistance Welding.** R. T. Gillette and J. F. Young. *American Machinist,* v. 87, no. 26, Dec. 23, '43, pp. 97-98.

Pulsation welding, percussion welding (a form of flash butt welding) and stored energy welding.

22-16. **Spot Welding in the Production of the DeHaviland "Mosquito."** R. W. Ayers. *Welding,* v. 11, no. 12, Nov. '43, pp. 487-493.

Spot welding light alloys, testing the welding machine, pickling.

22-17. **Welding in Shipyards.** W. G. John. *Welding,* v. 11, no. 12, Nov. '43, pp. 503-505.

Thermit process, fatigue strength of welded joints, design and application.

22-18. **Choice and Preparation of Welding Edges for Metal Arc Welding.** E. Fuchs. *Welding,* v. 11, no. 12, Nov. '43, pp. 494-498, 505.

Vee butt joint with and without backing strip, Double-Vee butt joint, U-butt joint, single bevel joint.

22-19. **Some Practical Considerations in the Design of Welded Structures.** R. G. Braithwaite. *Welding,* v. 11, no. 12, Nov. '43, pp. 520-527.

Advantages of various types of welds in regard to cost and physical limitations.

22-20. **The Weldability of Cast Iron.** T. J. Palmer. *Metallurgia*, v. 29, no. 169, Nov. '43, pp. 3-6, 25.

The different types of cast iron are outlined, and certain structural differences are illustrated. A welding process where the heat input per unit volume is relatively low is most suitable for the joining of cast iron, and gas welding methods form the subject of this discussion. Particular attention is given to fusion welding, which remains the most widely used process.

22-21. **Cycle-Welding Breaks the Barrier to Assembly with Cement Bonds.** *American Machinist*, v. 88, no. 1, Jan. 6, '44, pp. 106-114.

Savings realized on structural products not designed for the process indicate enormous possibilities for new constructions in the postwar period.

22-22. **How to Utilize Brazing in Design.** Colin Carmichael. *Machine Design*, v. 16, no. 1, Jan. '44, pp. 120-123, 198-200.

Proper heating method to secure strong and economical brazed joints; designing parts for furnace brazing, sources of high frequency current, fast heating time, fabricating technique.

22-23. **Soldering Techniques.** *Metal Industry*, v. 63, no. 25, Dec. 17, '43, pp. 392-393.

Design, preparation of work, fluxes, wiping solders, and hand-iron soldering.

22-24. **Fusion Welding of Wrought Aluminum Alloys—IV.** *Metal Industry*, v. 63, no. 24, Dec. 10, '43, pp. 375-376.

Carbon arc, Heliarc, atomic hydrogen welding, "Weibel" process, "Technotherm-Rakos" process, weld inspection.

22-25. **Fusion Welding of Wrought Aluminum Alloys—III.** *Metal Industry*, v. 63, no. 23, Dec. 3, '43, pp. 358-360.

Chemical and heat treatment, arc welding—preparation, electrodes, current conditions, procedure. Horizontal and vertical welding.

22-26. **Fusion Welding of Wrought Aluminum Alloys—II.** *Metal Industry*, v. 63, no. 22, Nov. 26, '43, pp. 343-346.

Welding rods, preparation for welding, technique used, vertical welding.

22-27. **Fusion Welding of Wrought Aluminum Alloys—I.** *Metal Industry*, v. 63, no. 21, Nov. 19, '43, pp. 326-328.

A general guide to the principles of fusion welding of wrought aluminum alloys and summary of the chief details of the procedure found by experience to be suitable for the gas and arc processes. As long as the underlying factors are understood it is possible and economic to make sound welds consistently and on a mass-production basis.

22-28. **The Influence of Welding Defects on the Resistance to Fatigue of Welded Steel Joints.** J. Dearden. Institute of Welding, *Transactions*, v. 6, nos. 3-4, July-Oct. '43, pp. 120-122.

A critical review of the technical literature.

22-29. **Third Interim Report on the Investigation of the Welding of Ships' Structures.** James Turnbull. Institute of Welding, *Transactions,* v. 6, nos. 3-4, July-Oct. '43, pp. 105-119.

Machine tests, description of tests and results.

22-30. **Welding of Aluminum for the Chemical Industry.** F. H. Keating and G. Haim. Institute of Welding, *Transactions,* v. 6, nos. 3-4, July-Oct. '43, pp. 135-143.

Corrosion, metallic arc welding of Al, manufacturing suitable electrodes, manufacture on a commercial scale.

22-31. **Welding Research and Development in the U.S.A.** H. W. G. Hignett. Institute of Welding, *Transactions,* v. 6, nos. 3-4, July-Oct., '43, pp. 99-104.

Comparison of British and American welding research.

22-32. **Experiments with the Fabrication of an Aero Engine Exhaust Manifold in Austenitic Chromium-Nickel Steel.** K. J. B. Wolfe. Institute of Welding *Transactions,* v. 6, nos. 3-4, July-Oct., '43, pp. 123-134.

Suitable materials and welding technique for the mass production of a radial-type aero engine exhaust manifold. Austenitic sheet materials recommended as "immune from weld decay" suffer intercrystalline corrosion under the Hatfield test after welding. Molybdenum bearing 18-8 type of sheet material and an 18-8 electrode has been produced containing both Mo and Cb as stabilizing agents. Welds produced by the above materials do not suffer intercrystalline corrosion under the Hatfield test. The physical condition of the welds was determined by means of the Olsen ductility test.

22-33. **Cycle-Welding Process for Bonding Structural Materials.** *Product Engineering,* v. 15, no. 1, Jan. '43, pp. 1-5.

Joining process for bonding of metallic and nonmetallic materials to each other in any combination.

22-34. **Welding Organization and Training.** C. W. Johnston. *Iron Age,* v. 153, no. 2, Jan. 13, '43, pp. 58-61.

Setting up an efficient welding organization and training welders.

22-35. **Control of Welding Hazards in Shipbuilding.** *Industry & Welding,* v. 17, no. 1, Jan. '44, pp. 40, 42.

Flash burns, welding fumes and lead poisoning in shipyards.

22-36. **Correcting Causes of Cracks in Welded Aircraft Engine Mounts.** Wm. H. Irwin. *Industry & Welding,* v. 17, no. 1, Jan. '44, pp. 32-33, 59.

Analysis of causes of cracks and technique for their correction.

22-37. **Welding to Speed Production of Military Trailers.** N. A. Rowe. *Industry & Welding,* v. 17, no. 1, Jan. '44, pp. 29-31.

Use of welding in production of 3 different types of trailers at Fruehauf plant.

22-38. **Carbon Arc Welding of Naval Brass.** K. L. Walker. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 25-29.

Carbon arc welding low pressure vessels of Naval brass.

22-39. **War Emergency Codes for Unfired Pressure Vessels.** E. R. Fish. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 30-33.

Emergency codes for unfired pressure vessels as established by the American Welding Society, A.S.M.E. Boiler Code Committee, American Petroleum Institute, American Iron & Steel Institute, the American Standards Association and government agencies. Special materials, flanges, safety factors.

22-40. **Rolling Mill Maintenance and Production Welding Problems.** Theodore W. Morgan. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 34-43.

Problems of maintenance and production in the welding department of Butler, Pa., Division of the American Rolling Mill Co. Apparatus maintenance and repair.

22-41. **Reclamation of Perishable Tools by Low Temperature Brazing.** W. A. Johnson. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 43-45.

Increased research, study and application of the oxyacetylene torch with low-temperature alloy rods can be used for repairing and reworking damaged or broken tools.

22-42. **The Job Shop—Yesterday and Tomorrow.** Fred W. Shackleton. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 46-47.

History, war work and probable future of job welding shops.

22-43. **Quality Control in Aircraft Spotwelding.** Nathan C. Clark. *Welding Journal,* v. 23, no. 1. Jan. '44, pp. 48-59.

Suggested steps to secure highest quality spotweld production in the aircraft industry by standardization of equipment, application of statistical control and monitoring of the spotwelding machines.

22-44. **Contact Resistance Measurements as Control for Preweld Cleaning of Aluminum Alloys.** G. W. Scott, Jr., and E. B. Charles. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 1s-7s.

When the contact resistance values from the final cleaning tank exceed a level chosen by experience it is an indication (1) that the solution has deteriorated from continued use, (2) that prescribed cleaning procedure has not been carefully followed, (3) that the cleaned material has been exposed to factory atmosphere too long, (4) that the solution has been accidentally contaminated, (5) that the solution concentration or pH has deviated from the optimum value or (6) that the material cleaned is below 0.040 in. in thickness. Apparatus and technique.

22-45. **Weldability Tests of Silicon-Manganese Steels.** Clarence E. Jackson, George G. Luther and Kenneth E. Fritz. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 33s-42s.

Technique, methods and results of tests. 17 ref.

22-46. **Discussion of Means for Evaluating Weldability of Alloy Steels.** S. A. Herres. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 43s-49s.

Causes of unweldability of steel and how their existence can be detected. 9 ref.

22-47. **Effect of High Welding Current Intensity on Shrinkage.** *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 60s-62s.

Investigations on arc butt welds to determine, for plates of various thickness, the amount of shrinkage caused by welding speed, strength of current and size and coating of electrode.

22-48. **Electric Resistance Welded Steel Tubing.** R. D. Malm. *Steel Processing,* v. 29, no. 12, Dec. '43, pp. 635-636.

Quality control factors: Analysis, surface finish, thickness tolerance, hardness, type, grain size, chamber, single slit or multiple strand.

22-49. **Weldability of 27% Chrome Steel Tubing.** R. A. Mueller, I. H. Carlson and E. R. Seabloom. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 12s-22s.

Materials, effect of temperature, electrode tests, preheating, heat treatment, metallographic examination, tensile tests. 24 ref.

22-50. **Ductile Weld Metal.** C. T. Gayley and J. G. Willis. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 8s-11s.

Significant increase in the ductility of arc-deposited mild steel weld metal was made by the use of shielded arc electrodes. Minor advances have since been made through improvements in the electrode coatings and the development of welding technique. These improvements make the deposition of mild steel weld metal having greater ductility than cast steel, or worked and annealed mild steel, an everyday occurrence. Consideration of the results obtained with the rapid transverse weave technique described herein makes it seem fair to conclude that in order to deposit mild steel weld metal of the highest ductility a proper balance between heat dispersion, energy of the arc, size of the electrode and rate of advance and traverse must be obtained.

22-51. **Better Welds Through Regulated Welding Current.** B. Copper. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 5-10.

Maintenance of welding current at its proper value in spite of variations in influential factors by use of current regulator as an auxiliary control.

22-52. **Electronic Control of Gas-Cutting Machines.** R. D. McComb. *Welding Journal,* v. 23, no. 1, Jan. '44, pp. 11-15.

Operation of a gas cutting machine with an electronic control. Diagrams of the control.

22-53. **Welding Non-Ferrous Metals.** Warren R. Coulter. *Canadian Metals & Metallurgical Industries,* v. 7, no. 1, Jan. '44, pp. 16-20.

Condensed review of practical techniques. Welding Cu, Cu-Si alloys; 18-8 and other stainless steels, Monel, Ni, Inconel and Al.

22-54. **The Production of Composite Tools.** *Machinery,* v. 63, no. 1625, Dec. 2, '43, pp. 631-634.

Process for making high speed steel tipped and butt welded tools.

22-55. **Fabricating Marine Parts.** J. R. Mitchell and A. A. Young. *Steel*, v. 114, no. 5, Jan. 31, '44, pp. 70-71.

Arc welding aids production record in manufacturing gear drives, templates, and other vital marine parts.

22-56. **Weld-Forging.** *Steel Processing*, v. 30, no. 1, Jan., '44, pp. 21-24.

Examples, results, gear-wheel assembly, bracket construction, choice of welding process, and smelting effects.

22-57. **Welding in the Eighth Army.** J. M. Whitworth. *Welding*, v. 12, no. 1, Dec. '43, pp. 3-8.

Contribution made by welders to the successful North African campaigns. Difficulties which had to be overcome to keep the mechanized forces of the Eighth moving onward.

22-58. **Application of Weld-Deposited Cutting Edges on Tools.** D. D. Howat. *Welding*, v. 12, no. 1, Dec. '43, pp. 35-39.

Advantages are: Saving in high-speed steel, greatly increased resistance to shock, reduction in wear and tear of machines, and good heat conductivity. Type of welding rod used, preparation, technique, treatment after welding, performance, and economics. Direct deposition of weld metal for repair. Arc welding and flash butt welding.

22-59. **Building-Up and Hard Surfacing by Welding.** William Andrews. *Welding*, v. 12, no. 1, Dec. '43, pp. 9-15.

The process of using fusion welding for renewing worn or corroded parts. It can also form part of the original design for many structures. 10 ref.

22-60. **Resistance Welding—a Film.** *Welding*, v. 12, no. 1, Dec. '43, pp. 16-21.

Synopsis of the commentary to the new sound film on resistance welding.

22-61. **Design for Welding.** F. W. Sykes. *Welding*, v. 12, no. 1, Dec. '43, pp. 22-27.

22-62. **Rotating Weldment Manipulator Cuts Welding Costs.** Harold E. Bailie. *American Machinist*, v. 88, no 3, Feb. 3, '44, pp. 94-96.

An easy-to-make manipulator cuts scavenger header welding costs in two by saving time and labor. The manipulator could be adapted to other odd-shaped weldments usually requiring much time, and labor-wasting positioning during the welding.

22-63. **Steel Plate Clad With Cupro-Nickel.** Joseph V. Kielb. *Metal Progress*, v. 45, no. 2, Feb. '44, pp. 276-279.

Parts for small, high duty condensers and liquid coolers, and for machinery covers to resist corrosive spray, are made of cupro-nickel sheet, welded to steel plate in hydrogen brazing furnace, using thin Cu film for joining material.

22-64. **Weldability of Steel.** Martin Seyt. *Metal Progress*, v. 45, no. 2, Feb. '44, pp. 298-304, 316.

Cracks in welds and welded structures; tests for hard areas; controlling ductility and hardness.

22-65. **Boron Treated Electrode Coatings Aid Cast Iron Welding.** J. A. Neumann. *Iron Age,* v. 153, no. 5, Feb. 3, '44, pp. 56-58.

Boron introduced into the coating of monel welding electrodes appears to behave as a flux, permitting thorough binding between the monel and cast iron, giving an excellent weld.

22-66. **"Heliarc" Welding Light Gage Butt Joints.** *Light Metal Age,* v. 2, Jan. '44, p. 16.

The use of the "Reverse Bevel" for eliminating microscopic cracks, and other considerations for obtaining good butt welds with light gage magnesium alloys.

22-67. **Electric Resistance Brazing.** C. Lynn. *Steel,* v. 114, no. 8, Feb. 21, '44, pp. 98-100, 126.

Electrical connections to commutators of motors and generators are detailed. Good joints are made without expensive solders, yet provide stronger and better connections.

22-68. **Helium - Shielded Arc Welding of Magnesium Alloys.** F. A. Wassell. *Welding Journal,* v. 23, Feb. '44, pp. 148-150, 152.

Power, helium, mechanics, joint preparation, backing plates, strength of butt joints.

22-69. **Production of Welded Hulls for Wheeled Tanks.** *Machinery (London),* v. 64, Jan. 6, '44, pp. 1-6.

Description of production of welded hulls for wheeled tanks employed by Guy Motors, Ltd.

22-70. **Thermit Welding in Production Work.** *Steel,* v. 114, Feb. 14, '44, pp. 102-103, 134.

Process long used for repair work now finding increasing applications as regular production tool in fabrication of heavy assemblies.

22-71. **The Silver Soldering of Electrical Connections.** J. E. Petermann and E. H. Frederick. *Industry and Welding,* v. 17, Feb. '44, pp. 70-72, 74-75.

Provision for the minimizing of the use of tin in the manufacture of electrical machinery by silver soldering.

22-72. **The Welding Engineer—What's His Job?** Walter J. Brooking. *Welding Engineer,* v. 29, Feb. '44, pp. 50-51.

The welding engineer's job varies greatly from firm to firm. Still there are certain basic responsibilities which are more or less common to all organizations. First of three-part series on arc welding engineering problems.

22-73. **Design of Spot Welded Aluminum Alloy Aircraft Structures (Part I).** Albert Epstein and H. O. Klinke. *Aero Digest,* v. 44, Feb. 1, '44, pp. 80-84.

Relation of physical properties of aluminum spot welds to the type of loads and service conditions experienced in aircraft, with particular reference to the primary structure of the airplane. Included is a general review of the factors that have limited the use of spot welding in primary structures in the past.

22-74. **Arc Welding Wins Its Spurs.** *Tool Engineer,* v. 13, Feb. '44, pp. 81-82.

Development of positioning equipment set the stage for a major production role for the forerunner of the modern welding process.

22-75. **Welding in the World of Tomorrow.** T. B. Jefferson. *Welding Engineer,* v. 29, Feb. '44, pp. 35-38.

New uses, new users, applications to new materials and the need to continue vocational school training programs are among author's predictions of what postwar future of welding is going to be.

22-76. **50,000 Spots per Day.** Jacob Joachimi. *Welding Engineer,* v. 29, Feb. '44, pp. 40-43.

Specialization speeds spot welding at Bell Aircraft Corporation, where welding operators have just one job —to operate their machines. A conveyor for metal cleaning is one of the factors which help to attain as many as 50,625 spots per working day from a single welder.

22-77. **Wartime Railroad Welding.** Arthur Havens. *Welding Engineer,* v. 29, Feb. '44, pp. 44-47.

Today new parts can be obtained, if at all, only after long delays, but our rolling stock is kept rolling by welders capable of working miracles with their torches.

22-78. **Injurious Welding Fumes.** Joseph Schuman Wright. *Welding Engineer,* v. 29, Feb. '44, pp. 48-49.

A welding operator discusses welding fumes in non-technical and non-medical language.

22-79. **Reinforcing Structures Under Load.** W. Spraragen and S. L. Grapnel. *Welding Journal,* v. 23, Feb. '44, pp. 65-s-92-s.

Reinforcement and repair of bridges and other structures, failures and methods of prevention, tests. A review of the literature until Jan. 1, '43. 89 ref.

22-80. **Gas Weld and Furnace Weld Tubing for Construction Purposes.** A. C. Weber. *Welding Journal,* v. 23, Feb. '44, pp. 113-120.

Manufacture of furnace and gas weld tubing, applications in dams, including Grand Coulee, embedded tubing systems.

22-81. **Railroad Repairs Switches by Welding.** Arthur Havens. *American Machinist,* v. 88, no. 4, Feb. 17, '44, pp. 91-92.

Because repairs with new parts averaged more than the cost of a new switch, the Rutland now welds worn parts, building them up to their original dimensions.

22-82. **Constant Current Ignitron Control for Resistance Welding Machines.** B. G. Higgins. *Welding,* v. 12, no. 2, Jan. '44, pp. 47-52, 81.

Power circuit, action of the circuit.

22-83. **The Welding of Light Metals.** *Welding,* v. 12, no. 2, Jan. '44, pp. 59-65.

Welding Al and Mg and their alloys. Details regarding the preparation of parts to be joined, procedure and equipment required.

22-84. **Choice and Preparation of Welding Edges for Metal Arc Welding.** E. Fuchs. *Welding,* v. 12, no. 2, Jan. '44, pp. 66-73.

Methods of preparation, common faults and their consequences of V-butt joints with and without backing strip; U-butt joint and single J joint; single bevel joint and fillet welds.

22-85. **Refrigeration of Electrodes in Resistance Welding.** A. L. Munson. *Welding,* v. 12, no. 2, Jan. '44, pp. 53-58, 65.

New method involving a system of electrode refrigeration which speeds up the assembly of aluminum alloys.

22-86. **Wire Bending Attachment on Spot Welder.** *Iron Age,* v. 153, no. 7, Feb. 17, '44, p. 73.

Simple bending attachment on a spot welder; designed and produced by the tool design department of the Boeing Aircraft Co., it has resulted in two workers producing as many straps in 1 hr. as six persons did previously in a full day.

22-87. **An Important Contribution to the Science of Welding.** D. Rosenthal. *Welding Journal,* v. 23, Feb. '44, pp. 92s-96s.

Evaluation of the papers "A Tentative System for Preserving Ductility in Weldments" and "Measurement of Cooling Rates Associated with Arc Welding and Their Application to the Selection of Optimum Welding Conditions." 8 ref.

22-88. **Spot Welding.** *Automobile Engineer,* v. 34, no. 445, Jan. '44, p. 19.

Use with heat-hardened aluminum alloys.

22-89. **Tentative Weldability Standards for Alternate Aircraft Steels.** Aircraft Welding Standards Committee of the American Welding Society. *Welding Journal,* v. 23, Feb. '44, pp. 140-146.

Tests to compare proposed alternate steels with standard aircraft steels: Tee-bend test, transverse butt-weld tension test of ¼-in. plate, transverse butt-weld tension test of ⅛-in. sheet, welded double-tube triangle test, transverse butt-weld tension test of 1-in. tubing.

22-90. **Dual Pressure Systems as Applied to Resistance Welding Machines.** S. M. Humphrey. *Welding Journal,* v. 23, Feb. '44, pp. 135-139.

Method of applying a dual pressure sequence to resistance welding, if such a sequence were to be used in a precision welding machine.

22-91. **Automatic Arc Welding Solves Production Problems.** R. F. Wyer. *Welding Journal,* v. 23, Feb. '44, pp. 128-134.

Applications involving metal arc and atomic-hydrogen arc welding.

22-92. **Modern Welding and Structural Design.** Alois Cibulka. *Welding Journal,* v. 23, Feb. '44, pp. 124-127.

New inventions made possible by welding.

22-93. **The Modern Weldery.** Louis T. Kenney. *Welding Journal,* v. 23, Feb. '44, pp. 121-123.

Process of electric arc welding as a production tool. Application to diesel gear casing and engine frame.

22-94. **The Electric Welding of Aircraft Tubing at Noorduyn Aviation, Ltd.** Donn Boring. *Industry and Welding,* v. 17, Feb. '44, pp. 40-42, 44, 46-47.
Electric arc welding procedure used at Noorduyn Aviation, Ltd.

22-95. **Braze Welding an Engine Cylinder . . . Another Ship in Service.** *Industry and Welding,* v. 17, Feb. '44, pp. 78-80.
Repair of cylinder of a triple-expansion engine broken at sea.

22-96. **Pointers in Passing Navy Yard Welding Tests.** Joseph Schuman Wright. *Industry and Welding,* v. 17, Feb. '44, pp. 36, 38.
Principles to remember in taking test.

22-97. **Prefabrication of Welded Ships in a Structural Steel Fabricating Plant.** E. T. Blix and J. C. Arntzen. *Welding Journal,* v. 23, Feb. '44, pp. 105-107.
History and description of work of prefabricating at Mississippi Valley Structural Steel Co.

22-98. **Production Spot Weld Testing.** James K. Dawson. *Welding Journal,* v. 23, Feb. '44, pp. 108-112.
Process of production spot weld testing. Test results, discrepancies, proposed tests.

22-99. **Arc Welding Builds Steady Rest for Lathe from Scrap.** S. Craig Cairns. *Welding Journal,* v. 23, Feb. '44, p. 112.
Material needed and procedure.

22-100. **Arc Welded Hydraulic Airplane Landing Gear Mock-up.** Henry Chasen. *Industry and Welding,* v. 17, Feb. '44, p. 33.
Construction of a mock-up hydraulic landing gear for airplanes for use by the Army in instructing students.

22-101. **The Control of Quality Workmanship—Plugging, II.** Robert Burnett. *Industry and Welding,* v. 17, Feb. '44, pp. 48, 50-51.
Definition and ways of eliminating plugging.

22-102. **Behavior of Welded Joints at Low Temperatures.** W. Spraragen and M. A. Cordovi. *Welding Journal,* v. 23, Feb. '44, pp. 97s-120s.
A review of literature to Jan. 1, '43. 82 ref.

22-103. **A Possible Application of Ultrasonics.** A. Behr. *Metal Industry,* v. 63, Dec. 31, '43, p. 422.
Application to welding and spot welding. 5 ref.

22-104. **High - Speed Soldering With Radio - Frequency Power.** John P. Taylor. *Electronics,* v. 17, Feb. '44, pp. 114-117, 232, 234.
Small metal containers, with bottoms and rings of solder in place, are carried along a moving belt and through an applicator coil at the rate of 2500 per hr. Localized heating induced in the metal causes the solder to flow and seals the bottom without endangering the capacitor.

22-105. **Drying Machine for Coated Welding Rods.** *Engineering,* v. 156, Dec. 31, '43, pp. 525-526.
Description of machine.

22-106. **Refrigerated Electrodes in Aircraft Welding.** *Tool & Die Journal,* v. 9, Feb. '44, pp. 104-106.
Description of the "Frostpoint" type of refrigerated electrode.

22-107. **Storage Battery Welding System.** *Steel,* v. 114, Feb. 28, '44, pp. 104, 106.
New batteries and new carbon pile "interruptor."

22-108. **Welded and Riveted Joints Compared.** J. Dearden. *Metal Treatment,* v. 10, Winter, '43-'44, pp. 207-210, 232.
The resistance of welded and of riveted joints to static and dynamic loading is compared with that of the parent plate as rolled. Reasons for the growing confidence in welded joints discussed and the limitations to the reinforcement of riveted joints by welding indicated.

22-109. **Light-Alloy Spot-Welding Machine.** *Engineering,* v. 157, Jan. 21, '44, pp. 47.
Description and illustrations of the high-capacity light-alloy spot-welding machine developed by Messrs. Philips Industrial (Philips Lamps, Limited).

22-110. **Tips Added to Coated Electrodes Reduce Welding Costs.** *American Machinist,* v. 88, March 2, '44, p. 87.
Savings in production costs on welding jobs can be made by using fully coated rods butt welded to short lengths of plain mild steel rods, thus enabling the welder to use all of the coated rod.

22-111. **1943 Electric Arc Welding Developments.** R. F. Wyer. *Modern Industrial Press,* v. 6, Feb. '44, pp. 13, 48.
Arc welding of magnesium in repair of castings; gas-shielded arc welding of wrought magnesium alloys; Changes in a.c. arc welding field with introduction of E-6011 electrodes. Use of outdoor type welders.

22-112. **Engineering Control Is the Key to Lower Welding Costs.** W. J. Conley. *Modern Industrial Press,* v. 6, Feb. '44, p. 34.
Production, methods and time study departments effect real savings by use of proper jigs and fixtures.

22-113. **Resistance Welding.** *Aircraft Production,* v. 6, Feb. '44, p. 98.
A Philips development for heavy-gage light alloy work.

22-114. **The Weibel Electric Welding Process.** *Aircraft Production,* v. 6, Feb. '44, pp. 93-95.
German information regarding its application for aircraft construction.

22-115. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, March 6, '44, pp. 116-119.
Various codes and identifications for welding electrodes designed to provide practical information for operators of welding equipment; suggests standardization of testing methods and cites need for simplification.

22-116. **Arc Welding Technique for Stainless Steel.** Charles Pettit. *Aero Digest,* v. 44, Feb. 15, '44, p. 102.
Making welds, electrode consumption.

22-117. **Arcweld Ventilated Housings for Outdoor Motors.** R. W. Gladson. *Industry & Power,* v. 46, March, '44, pp. 63-64, 138.

Design and fabrication of weatherproof fan-ventilated housings solve the problem of protecting 75-hp. motors of exposed pumping units. Cost is much lower than expense of constructing a building.

22-118. **The Application, Use and Control of Silver Solder Fluxes.** H. L. Anthony. *Steel,* v. 114, March 13, '44, pp. 94-96, 134, 136.

Types of fluxes; compositions of solid, paste and saturated solution fluxes; chemical composition of volatile fluxes; cleaning prior to fluxing and brazing; pH of applied fluxes; equilibrium at interface; removal of fluoride fluxes after brazing.

22-119. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, March 13, '44, pp. 98, 138-142.

Various classes of electrodes and their characteristics. Possibility of getting maximum value from arc welding comes only with a thorough knowledge of the characteristics of each type of rod. Class E 6010 rods discussed.

22-120. **Brazing.** *Steel,* v. 114, March 13, '44, p. 114.

Shows its versatility in volume production of many types of joints.

22-121. **Welding Refinements Simplify Sheet-Metal Fabrication.** *Product Engineering,* v. 15, March '44, pp. 166-169.

Electronic control of current in arc and resistance welding boosts the fabrication of light-gage sheet metal parts. Welding can replace riveting for this type of fabrication. Typical examples suggest welded stampings for simplified design.

22-122. **Resistance Welding.** Kenneth Rose. *Metals & Alloys,* v. 19, Feb. '44, pp. 357-363.

Welding carbon steel, stainless steel, aluminum, magnesium, copper and their alloys. Operating variables.

22-123. **Welding Speeds Forged Bogie Arm Production.** *Industry and Welding,* v. 17, no. 3, March '44, pp. 33-40.

The removal of flash, after completing production jobs of this kind, is an important factor, both from the cost and materials-flow standpoints. Here's how International Harvester Co. does it.

22-124. **Control of Surge for Large Resistance Welding Users.** G. L. Baughman. *Industry and Welding,* v. 17, no. 3, March '44, pp. 50-58.

Staggered operation of welders holds peak power demand to necessary limits without reduction of output.

22-125. **Automatic Cutting and Welding of Sprockets.** C. B. Dorgan. *Industry and Welding,* v. 17, no. 3, March '44, pp. 68-69.

The control of distortion in welding high carbon to low carbon steel.

22-126. **Erection and Welding Sequence as Applied to Welded Steel Hulls.** Montgomery Q. Cellers. *Welding Journal,* v. 23, March '44, pp. 205-216.

A study of expansion and contraction of metal in

relation to welding; method of controlling residual stresses and fabricating fair structures; flat and vertical keels; bulkheads and deck subassemblies; subassembly of a double bottom or platform, floors and bulkheads; subassembly of bow and stern; erection and welding of the hull of vessels of longitudinal construction; sequence for cargo vessels; the bottom shell; the double bottom; bulkheads, side shell, framing and decks; erection and welding of the superstructure and bilge plates.

22-127. **Machine Welded Metal Tubing.** G. C. Gridley. *Welding Journal,* v. 23, March '44, pp. 217-224.
Tube mill operations. Materials, welding, finished parts.

22-128. **Resistance Welding of the Future.** Malcolm Clark. *Welding Journal,* v. 23, March '44, pp. 224-226.
Developments to include spot welding machines, electrode materials, non-destructive testing, etc.

22-129. **The Control of Welding in Shipbuilding.** Russell W. Brendle. *Welding Journal,* v. 23, March '44, pp. 227-232.
Necessity for and the operations of a welding control center.

22-130. **Field Welding of Steel Penstocks and Tunnel Liners.** L. G. Christofferson. *Welding Journal,* v. 23, March '44, pp. 233-237.
Welding problems discussed with reference to two operations, the first of which is the welding of the plates into single or multiple ring sections in an assembly yard adjacent to the erection site, and second of which is the welding together of these sections in their final positions.

22-131. **Arcless Current Interruption in Inductive D. C. Circuits.** Charles W. Dodge, John S. Stamm and Nelson W. Spencer. *Welding Journal,* v. 23, March '44, pp. 238-243.
Problems involved in interrupting inductive circuits, method of current interruption by means of multiple pole contactors, physical considerations of shunting a condenser across a contactor, circuit equations when using shunt condensers, and description of new high-speed contactor.

22-132. **Peening—Its Effect on Relief of Residual Stresses, Distortion and Mechanical Properties of Welds.** W. Spraragen and M. A. Cordovi. *Welding Journal,* v. 23, March '44, pp. 121s-143s.
Equipment and technique, effect on relief of stresses, on distortion, on mechanical properties; grain refinement, hardness. 148 ref. Review of the literature to July 1, 1943. Foreign literature to Jan. 1, 1941.

22-133. **Two-Tone Welding.** J. A. Cunningham. *Welding Engineer,* v. 29, March '44, pp. 33-36.
Use of two-tone process with and without applicator bars speeds welding.

22-134. **"Storage Battery" Welding.** *Welding Engineer,* v. 29, March '44, p. 45.
D. C. resistance welder using storage batteries as a source of welding current.

22-135. **Prefabricated Ship Piping.** Ivan Chapman. *Welding Engineer,* v. 29, March '44, pp. 50, 52.

Installation of the 32,000 ft. of piping a Liberty Ship needs is a task requiring welding under confined conditions and fitting in almost inaccessible places. The job can be greatly simplified, however, by doing much of the fitting for final assembly outside the ship hold.

22-136. **Storage Resistance Welder Developed.** *Iron Age,* v. 153, March 23, '44, p. 61.

Practical D. C. resistance welder using storage batteries as a source of welding current.

22-137. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, March 20, '44, pp. 98, 101, 134, 137.

Discussion of class E6011 electrodes. More slagless gas, standardize on E6011, air-conditioned storage ideal.

22-138. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, March 27, '44, pp. 98, 100, 136-137.

Characteristics and most important applications.

22-139. **Tests Prove Advantages of Flame Soldering Cable Joints.** R. C. Fitzgerald. *Electric Light and Power,* v. 22, no. 3, March '44, pp. 70-72.

Saves solder and does not require high degree of skill. Microscopic examinations aid studies. Successful technique is explained.

22-140. **Capacitors Aid Resistance Welders.** J. E. Ponkow and N. A. Smith. *Westinghouse Engineer,* v. 4, March '44, pp. 34-38.

Users of resistance welders can almost double the capacity and current consumption of their machines, not by adding transformers or increasing the power demand, but through the addition of series capacitors.

22-141. **Some Notes on the Welding of Non-Ferrous Metals.** N. P. Inglis. *Metallurgia,* v. 29, Feb. '44, pp. 214-216.

The technical application of metals and alloys depends to an appreciable extent on their ability to be satisfactorily welded. The use of welding and of welded structures has now become so established that welding methods are invariably considered in the choice of a material. 9 ref.

22-142. **Tank Top Welding Repairs.** J. K. Johannesen. *Welding,* v. 12, Feb. '44, pp. 99-105.

1,135 ft. of welding repairs to a cargo ship damaged by grounding.

22-143. **Building up High Speed Tool Steel.** E. Denz. *Welding,* v. 12, Feb. '44, pp. 106-107, 118.

Methods used to overcome the shortage of high speed tool steel and emergency methods to repair cutting tools. 5 ref.

22-144. **Aluminum-Treated Steels.** William Bull. *Welding,* v. 12, Feb. '44, p. 109.

Research on their weldability.

22-145. **Welding Contraction.** *Welding,* v. 12, Feb. '44, pp. 110-112.

Distortion and "locked-up" stresses.

22-146. **Fusion Welded Drums and Pressure Vessels.** S. H. Griffiths. *Welding,* v. 12, Feb. '44, pp. 122-126.

Welding processes of joining the edges of rolled or pressed plates.

22-147. **Heavy-Gage Spot Welding.** *Engineers' Digest,* v. 1, March '44, pp. 247-248.

Resistance welding of light alloys of heavier gage than those in common use.

22-148. **Strength of Arc Welded Seams.** H. Cornelius and F. Bollenrath. *Engineers' Digest,* v. 1, March '44, pp. 249-251.

The properties of butt welds produced by metallic arc welding of high strength, heat-treated steel sheets of 3, 4 and 6 mm. thickness.

22-149. **Oxygen and Acetylene for Welding and Cutting.** *Steel Processing,* v. 30, March '44, pp. 156-158.

Sources. Oxygen cylinders; manifolds, calcium carbide and acetylene; acetylene from carbide; classes of generators.

22-150. **Resistance Welding.** Kenneth Rose. *Metals & Alloys,* v. 19, March '44, pp. 604-607.

Pre-cleaning, weld finishing, weld testing, etc.—on which depend the production of first-class welds in all materials resistance welded.

22-151. **Design of Spot Welded Aluminum Alloy Aircraft Structures.** Albert Epstein and H. O. Klinke. *Aero Digest,* v. 44, March 1, '44, pp. 121-123, 125, 194, 196, 199.

Testing spots for strength; sheets crack from oil canning; single-spot vs. single-rivet joints; comparative deflection important; protection against corrosion; strength of spot welded splices.

22-152. **Aluminum Welding at Willow Run.** Stanley H. Brams. *Iron Age,* v. 153, March 30, '44, pp. 46-50.

Ford is an advocate of spot welding aluminum sheet wherever feasible. Placing emphasis on proper cleaning and regular electrode maintenance, the Bomber Plant has worked all-purpose cleaning solutions and an electrode dressing device that help maintain high weld quality above the minimum AAF shear values. Refrigerated tips are not favored.

22-153. **Strip Mill Butt-Flash Welding.** *Iron Age,* v. 153, March 30, '44, pp. 56-58.

Design improvements incorporated in an 80-in. butt-flash welder for installation in a hot rolled strip line, feeding a continuous pickling line and a cold reducing mill for tin plate.

22-154. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, April 3, '44, pp. 136, 139, 140, 158.

Virtues and shortcoming of E6013 rods.

22-155. **Safeguarding From Faulty Welding in Installing Alloy Steel Liners.** *National Petroleum News,* v. 36, April 5, '44, pp. R-193-R-194.

Strip weld method developed by metallurgical engineer prescribes technique which facilitates good workmanship.

22-156. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, April 10, '44, pp. 104, 106, 148-151.

Class E6020 and 6030 unalloyed electrodes.

22-157. **Welded Hand Truck Simplifies Product Handling.** *Iron Age,* v. 153, April 13, '44, p. 59.

Designing and welding of a simple three-wheeled hand truck for handling welding machines in the shipping department.

22-158. **Flash-Butt Welding.** J. H. Cooper, J. J. Riley and J. C. Barrett. *Iron Age,* v. 153, April 13, '44, pp. 60-65.

Basic information for producing quality welds.

22-159. **Helium-Shielded Arc Welding of Magnesium Alloys.** F. A. Wassell. *Western Metals,* v. 2, April '44, pp. 21-24.

Welding power, helium, mechanics of welding, illustrations, joint preparation, backing plates, strength of magnesium alloy butt joints.

22-160. **Basic Principles of Joint Design for Machine Welding.** R. F. Wyer. *Industry & Welding,* v. 17, April '44, pp. 27-28, 68, 71-72, 74-77.

To obtain the maximum efficiency and production from automatic welding equipment proper joint design is the first prerequisite.

22-161. **Procedure in the Oxy-Acetylene Welding of PT Boat Engine Cylinder Water Jackets.** R. C. Van Deventer. *Industry & Welding,* v. 17, April '44, pp. 29-33.

In order to obtain satisfactory quality and uniformity it was found necessary to control all details of the entire fabrication to an unusual degree. Also, a mechanical form of stress relief was developed which removed the stresses normally left as the result of welding.

22-162. **Welding Speeds Fabrication of Diesel-Engine Crankcases and Marine Gear Cases.** C. U. Hansen. *Industry & Welding,* v. 17, April '44, pp. 50-51, 54.

The maximum allowable deviation from standard is 1/16 in. in the over-all dimensions of the crankcase assemblies and ⅛ in. in the gear cases. Welds are inspected by the Magnaflux method.

22-163. **Why Stress Relieve?** A. E. Bedell and J. B. Quigley. *Welding Engineer,* v. 29, April '44, pp. 35-39.

When and where to stress relieve and helpful hints on the proper methods and temperatures.

22-164. **Flame-Cutting Square Turrets.** H. F. Berg. *Welding Engineer,* v. 29, April '44, pp. 40-44.

A machine tool maker selects machine flame-cutting as a means of reducing machining cost. This choice results in a $35 saving on each square turret tool post

22-165. **The Welding Engineer—What's His Job?** Walter J. Brooking. *Welding Engineer,* v. 29, April '44, pp 42-44.

Evaluating welding electrodes, testing and re-testing, testing weldors, training new weldors, correlating plant departments, fixtures for welding.

22-166. **Finding the Best Welding Speeds.** Joseph Schuman Wright. *Welding Engineer,* v. 29, April '44, pp. 48-49.

A middle speed is best to avoid warping on butt-welded bars.

22-167. **Welded Tanks for Penicillin.** Clyde B. Clason. *Welding Engineer,* v. 29, April '44, p. 50.

Quantity production of new high-powered bacteria killer.

22-168. **Metallic Arc Welding Electrodes.** *Steel,* v. 114, April 17, '44, pp. 106, 124, 138, 140, 142.

Class E7010 electrodes.

22-169. **Flash-Butt Welding.** J. H. Cooper, J. J. Riley and J. C. Barrett. *Iron Age,* v. 153, April 20, '44, pp. 79-84.

Good and poor designing practice and recommendations which are predicated on creating balanced sections in the vicinity of the weld.

22-170. **Construction and Application of a Welded Jig.** Harold F. Wahl. *Machinery,* v. 50, April '44, pp. 156-158.

Description of a boring jig constructed by arc welding.

22-171. **Tool Tipping by Arc Welding.** George W. Given. *Metals & Alloys,* v. 19, April '44, pp. 856-858.

The conservation benefits and operating economies derived from the use of tipped tools, in which hardened high speed steel tips are affixed to ordinary steel shanks, are being increasingly enjoyed. Arc welding for this purpose has generally been avoided but arc welding with a suitable electrode can be both simple and satisfactory.

22-172. **Training Welders and Supervisors.** M. Q. Cellers. *Steel,* v. 114, April 24, '44, pp. 92-93, 146, 148, 150.

Lessons learned in training men for fabrication of ships on a large scale likely to prove useful to industry in establishing or improving existing production procedures.

22-173. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 114, April 24, '44, pp. 114, 134, 137, 138, 140, 142, 144.

Characteristics of class E7020 type.

22-174. **Welding in Production.** Vin Zeluff. *Scientific American,* v. 170, April '44, pp. 157-159.

Electronic control methods have increased reliability and speed in welding. Bringing precision operations to the assembly line. Factors governing quality of welds can be held automatically within predetermined limits. Magnesium now welded electrically.

22-175. **Elimination of Overhead Welding.** *Aero Digest,* v. 45, April 1, '44, pp. 74, 126.

Overhead welding must be eliminated to as great a degree as possible, for it is slow and difficult as compared with flat welding. Jigs can be so designed as practically to do away with this position in welding.

22-176. **Design of Spot Welded Aluminum Alloy Aircraft Structures.** Albert Epstein and H. O. Klinke. *Aero Digest,* v. 45, April 1, '44, pp. 94, 96, 98, 120, 122.

Spot spacing, tension and peeling forces, load per spot at flange 200 lb.

22-177. **Flash-Butt Welding.** J. H. Cooper, Jr., J. Riley and J. C. Barrett. *Iron Age,* v. 153, April 27, '44, pp. 48-54.

Techniques for controlling metallurgical changes around the heat-affected zone at the weld line and in the parent metal. Defects found in flash-butt welding are illustrated, the causes are indicated and remedies proposed. 11 ref.

22-178. **Longer Life from Tipped H. S. S. Tools.** Leo J. St. Clair. *Iron Age,* v. 153, April 27, '44, pp. 55-57.

Use of a soft, resilient bond and braze allows the use of hardnesses in the tip that would ordinarily be too high for safety in a solid tool and enables tipped high speed steel tools to out-perform solid tools of the same analysis. Wider use of high cobalt types in tip form is indicated.

22-179. **Oxyacetylene Pipe-Line Installations.** D. F. Guthrie and R. W. Stewart. *Welding Journal,* v. 23, April '44, pp. 301-310.

Engineering aspects of planning installation of oxyacetylene pipe line for different types of industries.

22-180. **Large - Diameter Electrodes Speed up Shell Welding in Ship Construction.** M. H. MacKusick and R. V. Anderson. *Welding Journal,* v. 23, April '44, pp. 311-315.

The deep fillet procedure developed at the California Shipbuilding Corp. for welding fillets using E-6020-30 electrodes has more than doubled production footage where the use of this procedure is feasible; also electrodes ⅜-in. in size are being used for conventional welding in the flat position.

22-181. **Welded Plate-Girder Bridge Separates Connecticut Highways.** John F. Willis. *Welding Journal,* v. 23, April '44, pp. 315-317.

Unusual both in design and fabrication methods, this structure was under construction before the present priorities for steel went into effect. Over 12 miles of fillet welding was used, and it proved to be economical both of materials and of labor. Unit price data are also furnished.

22-182. **Hard Facing.** J. R. Spence. *Welding Journal,* v. 23, April '44, pp. 318-322.

Some pertinent facts concerning hard facing materials and their properties and why one type of hardfacing alloy may be superior to others for specific applications.

22-183. **The Welding of Copper Alloys.** C. E. Swift. *Welding Journal,* v. 23, April '44, pp. 323-326.

Welding procedures and welding rods for use with copper alloys are described and the fundamental characteristics of these metals that affect their weldability.

22-184. **The Application, Manufacture, Composition and Storage of Coated Metallic Arc Electrodes.** Orville T. Barnett. *Welding Journal,* v. 23, April '44, pp. 327-333.

A wide range of applications requiring a variety of characteristics, both metallurgically and from an operational standpoint, has made necessary some six fundamental types of mild steel welding electrodes. The application, manufacture, composition, and storage of these ordinary steel metallic arc-welding electrodes. 16 ref.

22-185. **How to Start a Cut Quickly.** H. H. Griffith. *Welding Journal,* v. 23, April '44, p. 334.

Trouble in getting a cut started when the starting point is not at an edge or corner of the work can be overcome by turning up a burr with a cold chisel at the point at which the cut is to start.

22-186. **A Review of Bronze Welding.** H. R. Morrison. *Welding Journal,* v. 23, April '44, pp. 336, 338.

Advantages, procedures and uses.

22-187. **Spot Weld Joint Efficiency.** S. Wong and C. W. Steward. *Welding Journal,* v. 23, April '44, pp. 170-s-184-s.

The type of joint pattern, the method of surface preparation prior to welding, and the many variables involved in the spot welding process are factors which contribute to the effectiveness of the joint. Test data and a description of the results. 4 ref.

22-188. **A Test of Longitudinal Welded Joints in Medium and High-Tensile Steel.** A. G. Bissell. *Welding Journal,* v. 23, April '44, pp. 185-s-191-s.

In using the available electrodes, unless a very short arc was used, hard and brittle deposited metal was obtained. By experimental work it was demonstrated that the contributing factor to this hardness was atmospheric nitrogen. 3 ref.

22-189. **Steel Castings—Their Properties and Use in Weldments.** E. J. Wellauer. *Welding Journal,* v. 23, April '44, pp. 193-s-200-s.

The engineering and metallurgical properties of cast steel suitable for welding; the factors of design and specification required to insure satisfactory castings for welding; the economics of steel castings for weldments including typical examples. 4 ref.

22-190. **Weldability of Steel.** Martin Seyt. *Welding Journal,* v. 23, April '44, pp. 200-s-205-s.

Cracks in welds and welded structures, tests for hard areas, controlling ductility and hardness.

22-191. **The Effect of Peening as a Method of Stress Relieving Applied to Welds.** O. H. Henry and E. M. Damen. *Welding Journal,* v. 23, April '44, pp. 206-s-207-s.

The relative importance of rate of peening on the amount of stress relief accomplished by the application of this method.

22-192. **Stress-Relieving and Peening Temperatures.** Ralph E. Spaulding. *Welding Journal,* v. 23, April '44, p. 208-s.

Temperature-strength curve showing variations in physical characteristics of structural steel due to temperature changes.

22-193. **Practical Ways to Improve Machine-Cutting.** *Oxy-Acetylene Tips,* v. 23, April '44, pp. 37-44.

Nozzle selection, flame adjustment, starting the cut, per cent of lag, characteristics of kerf, bevel cuts.

22-194. **How to Weld Steel Plate.** *Oxy-Acetylene Tips,* v. 23, April '44, pp. 45-50.

Simple instructions that will help the operator to master the forehand welding of low carbon steel.

22-195. **Minimizing Hazards.** *Oxy-Acetylene Tips,* v. 23, April '44, pp. 52-54.
Welding and cutting fires and accidents are preventable. 9 ref.

22-196. **Hints on Silver - Brazing.** *Oxy-Acetylene Tips,* v. 23, April '44, pp. 55-57.
Physical properties; flux is essential; use proper heat; corrosion resistance.

22-197. **Bronze-Welding an Ore Roaster.** *Oxy-Acetylene Tips,* v. 23, April '44, p. 57.
Repair of damaged casting prevents long shutdown.

22-198. **Welding Refinements Simplify Sheet-Metal Fabrication.** *Product Engineering,* v. 15, March '44, pp. 166-169.
Electronic control of current in arc- and resistance-welding boosts the fabrication of light-gage sheet-metal parts. Welding can replace riveting for this type of fabrication. Typical examples suggest welded stampings for simplified design.

22-199. **Automatic Arc Welding.** G. W. Birdsall. *Steel,* v. 114, May 1, '44, pp. 100-103, 138, 140-141.
Effective method for producing parts on mass production basis in making upper rollers for half-tracs.

22-200. **The Relation Between Weldability and Wear of Cutting Tools.** Walter Dawihl and Walter Rix. *Metallurgia,* v. 29, March '44, pp. 270-272.
Wear of cutting tools used for the machining of steel is due mainly to the formation of welds between the tool and the material to be cut. The influence of time and pressure on the strength of welds between steel and steel, and between steel and cemented carbides, contributes further evidence in support of this. 17 ref.

22-201. **Plastic Bonding.** *Aircraft Production,* v. 6, April '44, pp. 171-172.
Cycleweld process in making joints between metal, wood and other materials.

22-202. **British Merchant Shipbuilding.** R. B. Shepherd. *Welding,* v. 12, March '44, pp. 145-156, 164.
Aspects of recent changes in merchant ship construction; provision and installation of heavy duty welding equipment; high speed procedures and modifications to hull form for fabrication.

22-203. **New Design for Barges.** *Welding,* v. 12, March '44, pp. 157-158.
Utilization of welded steel frames and concrete.

22-204. **Aluminum Welding with Liquefied Gas.** J. V. Kielb. *Iron Age,* v. 153, May 4, '44, pp. 67, 152.
Propane (C_3H_8) gas as an alternate fuel for welding aluminum sheet metal and castings. Due to its low cost and safety features, its application in the past few years has spread tremendously in such fields as cutting of steels, fuel for carburizing furnaces and other heat treating operations.

22-205. **Atomic Hydrogen Welding.** Percy H. Take. *Canadian Metals and Metallurgical Industries,* v. 7, April '44, pp. 33-34, 40-41.

Application, advantages, equipment, operation and procedure.

22-206. **Flash - Weld Proof - Loaders.** Weller Johnson. *Automotive and Aviation Industries,* v. 30, May 1, '44, pp. 34-35, 152.

Description of proof-loading machines for testing ⅜-in. control rods and ¾-in. and 1-in. tubes.

22-207. **Spot Welding Substituted for Riveting on B-17 Sub-Assemblies.** F. C. Pipher. *Automotive and Aviation Industries,* v. 30, May 1, '44, pp. 40, 88.

Investigation has revealed average savings in cost of 57% over the hand riveting method.

22-208. **Maintenance of Resistance Welders.** E. R. Spittler. *Industry & Power,* v. 46, May '44, p. 75.

Indicates the resistance welding units that require special attention to insure uninterrupted production.

22-209. **Blow-Hole Formation in Oxy-Acetylene Welding of Aluminum Alloy.** Th. Ricken and H. Gagel. *Engineers' Digest,* v. 1, April '44, p. 283.

Blow-hole formation is fostered by the heat insulating action of the firebrick backing, while the high thermal conductivity of the copper insured a rapid removal of welding heat, thus suppressing blow-hole formation in aluminum alloys.

22-210. **Joint Fit-Up and Backing Plates for Welding Magnesium.** F. A. Wassell. *Automotive Industries,* v. 90, May 1, '44, pp. 34, 82.

For the welding of the lighter gages of magnesium, up to around 3/16 in., small welders of approximately 150-amp. capacity are used; but for the welding of the heavier gages or for high-speed welding, machines of about 300 amp. are required. Mg is always welded with reverse polarity, with the electrode positive and the work negative, since straight polarity results in an unstable arc and excessive spatter.

22-211. **Beam Marks the Spot.** A. B. White. *Metal Progress,* v. 45, May '44, p. 903.

Use of pinhole lamp for spacing spot welds.

22-212. **Hard Surfacing by "Two-Tone" Welding.** Joseph A. Cunningham. *Metal Progress,* v. 45, May '44, p. 903.

Method cuts time required for rebuilding of worn surfaces.

22-213. **Worn Parts Rebuilt by "Two-Tone" Arc Welding.** J. A. Cunningham. *Iron Age,* v. 153, May 11, '44, pp. 72-73.

A new technique using an auxiliary cast iron or high carbon steel filler rod in conjunction with an arc welding electrode speeds up rebuilding of worn surfaces by as much as 300%. Originally applied to the repair of contractors' equipment, the process should find use in maintenance of all kinds of heavy machinery subject to abrasive wear.

22-214. **Instrument Signals Spot Weld Consistency.** Harold J. Hague. *Iron Age,* v. 153, May 11, '44, p. 77.

Weld comparer consists of instrument, housing, gong, transformer, range switch and sensitivity control.

22-215. **Brazing Applications Produce Strong Non-Corrosive Joints.** Lawrence D. Jennings. *American Machinist*, v. 88, May 11, '44, pp. 90-93.

Process for joining metals proves economical in fabricating small and intricate parts. Copper and silver-copper alloys used as brazing materials.

22-216. **Flame-Cutting Big Crankshafts.** R. L. Deily and E. Benyo. *Welding Engineer*, v. 29, May '44, pp. 33-35.

Because wartime necessity made the normal procedure of forging and machining impossible, flame-cutting had to be used to produce giant five-throw ship crankshafts. Thicknesses up to 42 in. were successfully cut with the torch in this important assignment.

22-217. **Welding Silver-Clad Steel.** Arthur Schwarz and Walter B. Meyer. *Welding Engineer*, v. 29, May '44, pp. 36-38.

Difficult welding problems encountered in the "pioneer" fabrication of large silver-lined columns for an oil-refining process overcome.

22-218. **Tanks for Big Navy Guns.** T. B. Jefferson. *Welding Engineer*, v. 29, May '44, pp. 39-41.

Electric-hydraulic rammer tanks must be fabricated to close tolerances. Difficult welding problems to solve at Northern Ordnance.

22-219. **The Welding Engineer—What's His Job?** Walter J. Brooking. *Welding Engineer*, v. 29, May '44, pp. 42-44.

The establishment of general welding procedures.

22-220. **Servicing Welder Controls.** E. Stolte and R. Washburn. *Welding Engineer*, v. 29, May '44, pp. 45-47.

Electronic control panels are seldom the cause of troubles in resistance welding circuits. What to do when they are.

22-221. **Welders in 40 Hours.** *Welding Engineer*, v. 29, May '44, p. 48.

Moore Dry Dock Co. standardized welding instruction. Welders capable of fine production work can be turned out with 40 hours of pre-employment training plus 2 to 3 months' training on the job.

22-222. **Health Hazards Associated with Welding.** F. W. Hutchinson. *Heating and Ventilating*, v. 41, May '44, pp. 73-77.

Classification of hazards, irradiation, fumes, gases, criteria and methods of control.

22-223. **New Steel-Aluminum Bond Boosts Engine Power.** Marshall G. Whitfield and Victor Sheshunoff. *Product Engineering*, v. 15, May '44, pp. 333-335.

Composite steel and aluminum cylinder barrels, which are used in Ranger aircraft engines to increase power by combining the strength of steel with the rapid heat dissipation of aluminum, show the possibilities of a new method of bonding these two materials together for all kinds of parts—castings, forgings, sheet metal, and others.

22-224. **The All-Welded 105-Mm. Howitzer Carriage.** Eugene Morze and Ernest Kalist. *Industry & Welding*, v. 17, May '44, pp. 29-31, 66, 68-72.

In all-welding procedure a careful and judicious use

of arc temperature and position is maintained so as to afford maximum penetration with least defects and inclusions.

22-225. **Repair Welding a Heavy Cylinder Casting.** J. R. Mitchell. *Industry & Welding,* v. 17, May '44, pp. 32-33, 37-38.

Description of an arc welded repair on the cylinder casting of a 2800-ton hydraulic press demonstrates the importance of welding in our present war effort.

22-226. **Reclamation of Armature Bearings for Street Railways.** E. E. Olson. *Industry & Welding,* v. 17, May '44, pp. 42-43.

How a production increase of 175% and a reduction in cost of 78% was effected by changing from a former method.

22-227. **Stud Welders Speed Ships.** *Industry & Welding,* v. 17, May '44, pp. 46-47.

Principle and application of the stud welder.

22-228. **Controlled Atmosphere Brazing in Aircraft Engine Production.** *Industry & Welding,* v. 17, May '44, pp. 62-64.

Steps preparatory to copper brazing the fins in the two parts of a fluid impeller drive for the supercharger on the 2000-h.p. Pratt & Whitney aircraft engine being manufactured in the Kenosha Plant of Nash-Kelvinator.

22-229. **Welded Heaters Keep Our Navy Warm.** *Industry & Welding,* v. 17, May '44, pp. 80-81.

To meet the requirements for strength, compactness and light weight, McQuay, Inc., Minneapolis, manufacturers of ventilating heaters, has adopted welding construction for their units.

22-230. **Tips on the Care and Maintenance of Production Resistance Welding Equipment.** E. R. Spittler. *Industry & Welding,* v. 17, May '44, pp. 82-86.

The maintenance tips resulting from many years of practical experience with resistance welding equipment.

22-231. **Arc Welded Table for Oxy-Acetylene Cutting.** Charles Apacki. *Industry & Welding,* v. 17, May '44, pp. 87-88.

Table made from scrap tubing, angle iron, and pipe.

22-232. **Blast Furnace Equipment Repair.** F. L. Lindemuth. *Industry & Welding,* v. 17, May '44, pp. 89-94.

All the work done from the outside of the furnace and without shutting it down.

22-233. **Soldering Signal Corps Equipment.** Milton Salant. *American Machinist,* v. 88, May 25, '44, p. 114.

Cleaning the joint, sound joints, flux, weight of iron, shape of iron, soldering technique, precautions when soldering.

22-234. **Welding Sequence in Shipbuilding.** Milton Forman. *Welding Journal,* v. 23, May '44, pp. 401-407.

Welding engineering no longer blind and experimental. Results can be achieved if the instructions are properly transmitted to the men supervising and doing the work. There should be no job or problem that is not analyzed by the welding engineer.

22-235. **Atomic-Hydrogen Arc Welding in Aircraft Production.** Wm. J. Van den Akker. *Welding Journal,* v. 23, May '44, pp. 408-410.

Achievement in the field of the welding of light-gage materials used in the aircraft industry. Fuller utilization of existing welding facilities coupled with an increased knowledge of welding design as well as of the metallurgical characteristics of the special alloys used.

22-236. **Organization and Reclamation of Tools and Gages.** Joseph V. Kielb. *Welding Journal,* v. 23, May '44, pp. 417-422.

Functions of departmental heads essential to a successful tool reclamation program.

22-237. **Sequence in Welding of Ships.** O. Ovregaard. *Welding Journal,* v. 23, May '44, pp. 423-433.

Desirable method and sequence of welding in ship's hulls. Welded connections, static strength of welded hulls, fatigue, advantages of welding in connection with ship construction, emergency cargo vessel for war purposes, design and erection, vessel for war purposes, sequence proper.

22-238. **Arc Welding in Airplane Boiler Fabrication.** H. A. Lebert and S. B. Willoughby. *Welding Journal,* v. 23, May '44, pp. 434-437.

Manufacturing corrugated boilers reduced to its simplest form through the use of arc welding.

22-239. **Shrinkage Stresses in Welding.** Review of the Literature from Jan. 1, 1937, to Sept. 1, 1943 (Foreign Literature to Jan. 1, 1941). W. Spraragen and M. A. Cordovi. *Welding Journal,* v. 23, May '44, pp. 209-s-246-s.

Butt joints, unionmelt, fillet welded joints, welded bridge girders, welded cylindrical members, beads deposited on surface and edges of plate, pre-heating, stress relief by thermal treatment and peening, behavior of residual stresses under external load, cracks, crack-sensitivity tests, theoretical aspects. 124 ref.

22-240. **Properties of Heat-Treated Flash Welds in a Chromium - Nickel - Molybdenum Steel.** J. C. Barrett. *Welding Journal,* v. 23, May '44, pp. 250-s-254-s.

Problems of obtaining a flash-welded part which, in the heat treated condition, will have properties as good as the unwelded stock.

22-241. **Stress Distribution in Spot-Welded Joints.** G. P. Michailov. *Welding Journal,* v. 23, May '44, pp. 255-s.

Stress distribution patterns produced on loading multiple spot-welded joints in steel.

22-242. **New Developments in Use of Welding in Production of Stamped Products.** *Steel Processing,* v. 30, May '44, pp. 289-291, 296.

Economics of the use of stamped, drawn and pressed metal, growth in the use of welding, of all types, in the joining of stampings.

22-243. **Cost of Meehanite Castings vs. Welded Structures.** L. F. Williams. *Iron Age,* v. 153, May 18, '44, pp. 78-82.

In the manufacture of diesel engine components from welded steel fabricated both within and without its own shops, this company compares factory costs with those of comparable parts machined from Meehanite castings and has found them very much in favor of castings when production runs are moderate.

22-244. **Stresses in Welded Structures.** H. C. Boardman. American Iron and Steel Institute Advance Paper, May 25, '44, 11 pp.

Concerns fusion welded structures of plain low carbon steels having well-defined plastic yield ranges at about one half of the ultimate strength. Discusses the questions: What are the corresponding plastic yield ranges for all conditions of biaxial stresses (all-directional in a plane) and for all conditions of triaxial (all-directional) stresses? When does plastic yielding mean safety? When does it mean failure?

22-245. **Recent Progress in the Scientific Application of Welding to Steel.** Wendell F. Hess. American Iron and Steel Institute Advance Paper, May 25, '44, 11 pp.

Factors affecting the successful application of welding: Metallurgical response characteristics of the steel, selection of the process of welding, design of the structure, production of residual stresses. Methods of solving welding problems, involving thermal measurements and mechanical and hardness tests.

22-246. **Welding Is the Way in Our Fighting Ships.** *Industry & Welding* (Welded Products Ed.), pp. 13-24.

The Naval Limitation Treaties of the 20's and 30's were the impetus behind the whole research program which led to a new conception of welding in ship construction. The process made possible more speed and fire power without increasing over-all tonnage beyond the limitations of the treaties. Navy experience in this work gave the background necessary for swinging American shipyard production into high gear when the Maritime Commission demanded 16,000,000 tons of new shipbuilding for 1943.

22-247. **Rough, Tough and on Time.** *Industry & Welding* (Welded Products Ed.), pp. 29-36.

Producing armament at a rate unparalleled in history. Welding bears a large responsibility in this accomplishment.

22-248. **These Above All.** *Industry & Welding* (Welded Products Ed.), pp. 41-48.

In plans for the immediate and distant future the welding processes are assuming great importance in aircraft construction.

22-249. **New Things on Wheels Better on the Long Haul.** *Industry & Welding* (Welded Products Ed.), pp. 53-64.

Future automobiles and trains will be lighter, stronger, more economical to operate and better looking. Welding processes make this possible.

22-250. **Where It Takes Strength and Precision and Flexibility.** *Industry & Welding* (Welded Products Ed.), pp. 67-78.

No more striking example of the strength and flexibility inherent in the mass production of tools can be

found than in the manufacture of contractors' equipment and in the machinery field. By taking advantage of welding these products are being made faster and cheaper, without jeopardizing quality.

22-251. **The Hottest Flame Known to Man.** *Industry & Welding* (Welded Products Ed.), pp. 87-94.

No more versatile tool can be found than the oxy-acetylene flame, which has multitudinous applications in virtually every phase of industry. This vast usage has become increasingly important with the impact of war work.

22-252. **Structural Steel Tames the Giants.** *Industry & Welding* (Welded Products Ed.), pp. 97-108.

Development of steel bridges and buildings has entailed research and study in the proper placement of metal for long life and safety. Heavy engineering projects of this kind have begun, comparatively recently, to use welded structural steel—placed where it will do the most good—to meet the problems of fighting or using nature for man's own purposes.

22-253. **New Highs and Lows for Our Chemical World.** *Industry & Welding* (Welded Products Ed.), pp. 117-128.

Essential welding to enable us to reach new highs and lows in our chemical world.

22-254. **Maintenance and Repair—a Major Industrial Problem.** *Industry & Welding* (Welded Products Ed.), pp. 137-144.

The welding method of repair has long since passed beyond the realm of fixing a furnace or automobile frame and has graduated into a real tool to keep American industrial activity at its highest pitch.

22-255. **Universal Jig and Clamp.** *Steel*, v. 114, May 29, '44, pp. 100, 102.

These are found to be widely adaptable for many welded constructions.

22-256. **Arc Welding Electrodes.** W. Andrews. *Welding*, v. 12, April '44, pp. 186-193.

The modern electrode for electric arc welding is a vital factor in welded production. Study of the developments in electrode manufacture; various types of electrodes and their differences are clearly defined.

22-257. **Welded I-Sections.** H. Gottfeldt. *Welding*, v. 12, April '44, pp. 194-196.

Graphical solutions to design problems.

22-258. **Welding Research.** W. C. E. Barnes. *Welding*, v. 12, April '44, pp. 197-201.

Laboratories of the Arc Manufacturing Co.

22-259. **Prefabricated Farms.** G. Herrick. *Welding*, v. 12, April '44, pp. 202-203.

Welded units for mass produced dwellings.

22-260. **Control of Moisture in Electrode Coatings.** R. V. Anderson. *Iron Age*, v. 153, June 1, '44, pp. 48-51.

Absorption of moisture by electrodes seriously affects the quality of arc welds and is a real problem in shipyards where the relative humidity in coastal areas is seldom less than 70%. After carrying out some labora-

tory experiments on electrode drying, this shipyard has developed a system for storing electrodes under controlled conditions up until the time they are actually used.

22-261. **Resistance Welding Controlled Precisely by Electronic Tubes.** T. R. Lawson. *American Machinist,* v. 88, June 8, '44, pp. 91-95.

Vast wartime production enlarges field of electronic control in fabricating sheet-metal parts. Functions of tubes explained and compared with older control devices for industrial operations.

22-262. **Broken Press Frame Casting Redesigned to Welded Steel.** W. J. Conley. *Iron Age,* v. 153, June 8, '44, pp. 58-59.

Replacing a cast iron frame which failed due to overload with a welded steel unit increased the safe load capacity by 66% at a weight saving of 20%.

22-263. **Shadow of the Future.** T. B. Jefferson. *Welding Engineer,* v. 29, June '44, pp. 35-39.

Impressions of basic problems which will confront industry in general and welding in particular in the postwar world.

22-264. **Brazing Armature Coils.** C. Lynn. *Welding Engineer,* v. 29, June '44, pp. 44-46.

Soldered and brazed necks, joints air-cooled, brazing advantages, armature coils, cutting down brazing time, the brazing head, brazing procedure, portable equipment, cross connection joints.

22-265. **Teaching Wilma to Weld.** Roy J. Quinn. *Welding Engineer,* v. 29, June '44, pp. 47-49.

Comprehensive account of what is involved in teaching a lady to become a ship welder.

22-266. **Welded Processing Machine.** L. J. Schwartz. *Welding Engineer,* v. 29, June '44, pp. 66, 68, 70.

Both strength and rigidity had to be obtained in a machine to process insulation material for buildings. An arc-welded structure gave both and resulted also in a considerable dollar saving in production costs.

22-267. **Sheet-Steel Stamping Assemblies Produce Economies in Production.** D. H. Gaston. *Product Engineering,* v. 15, June '44, pp. 364-367.

Use of sheet-steel stamping assemblies and other simplifications in redesigning structural parts, especially where furnace copper brazing can be employed, have resulted in drastic savings in man-hours, faster production, and usually reductions in weight without sacrifice in strength of parts.

22-268. **The Welded Joint in Non-Ferrous Chemical Plant.** W. K. B. Marshall. (Paper at Joint Meeting of Institution of Chemical Engineers & Chemical Engineering Group of the Society of Chemical Industry, March 14, '44.) *Engineers' Digest,* v. 1, May '44, pp. 339-340.

Physical discontinuity can be said to exist if it is possible to detect a difference between the parent metal and the joint by any form of mechanical test. Chemical discontinuity exists when it is possible to detect a

difference between the joint and the parent metal by chemical methods, such as etching or corrosion tests.

22-269. **Two-Tone Welding.** J. A. Cunningham. *General Electric Review,* v. 47, June '44, pp. 24-28.

New process speeds up welding as much as 300%; use of filler bars.

22-270. **Silver Brazing Electrically.** Edwin G. Ryan. *General Electric Review,* v. 47, June '44, pp. 40-41.

For precise electrical measuring devices. So firmly bonds lead wires to coils that the joint resistance is stable. Method of application simple.

22-271. **The Deposition of Hard-Facing Alloys by Welding.** P. L. Pocock. *Metallurgia,* v. 29, April '44, pp. 289-292.

The value of hard facing is increasingly appreciated largely as a result of developments in materials and in the technique of welding them to suitable base materials required to resist wear, corrosion or both. Fusion welding of hard alloys.

22-272. **The Investigation of Microstructures of Single-Bead Chromium-Nickel Austenitic Weld Deposits on S.A.E. 4340 Plus Vanadium Steel.** Anton Louis Schaeffler. Thesis, University of Wisconsin, June '44.

22-273. **The Effect of Furnace Deoxidation Practice on Atomic Hydrogen Weldability of S.A.E. 4330 Steel.** Nevzat Altan Gökcen. Thesis for M.S. Degree, University of Pittsburgh, June '44.

22-274. **Welding in Postwar Steel Construction.** La Motte Grover. *Iron Age,* v. 153, June 15, '44, pp. 71-73.

Arc welded fabrication vs. riveted construction in postwar building. Consensus is that welding is fine for plate fabrication but not so applicable to straight fabricated structural steel.

22-275. **Cuts Soldering Time 997%.** *Steel,* v. 114, June 19, '44, p. 98.

Soldering job formerly took 16 min., but with the introduction of induction heating, the time was reduced to 2½ sec. Preliminary preparation of the cans and covers, which are stamped or drawn from terne plate, is simply to apply flux, to allow the solder to run freely and adhere to the base metal. The condenser element is inserted into the can, and its leads electrically fastened to the terminals, which are brought through the cover of the can.

22-276—**Welding as Applied to Track Work on the L.M.S. Railway.** N. W. Swinnerton and Hugh O'Neill. *Institute of Welding Transactions,* v. 7, March '44, pp. 1-15.

Reconditioning of worn and damaged switches and crossings, welding plant and electrodes, procedure for switches and crossings, welding of electric track components, welding of rails together for running track, welding of other track components, rail steel and metallic arc welding, gas welding on rail steel, features of welded rail joints, precautions to be observed. 9 ref.

22-277. **Some Notes on the Welding of Non-Ferrous Metals.** N. P. Inglis. *Institute of Welding Transactions,* v. 7, March '44, pp. 16-27.

Main features which must be recognized in the welding of Cu, Ni, Al, Ag and their alloys in common use, and some of the inherent difficulties associated with the welding of them. 9 ref.

22-278. **Machine Tools Modernized Through Arc Welded Motor Drives.** John P. Berkeley. *American Machinist,* v. 88, June 22, '44, pp. 102-104.

Welded steel motor drives give better service, can be made to fit application better and cost considerably less than cast iron drives made for comparable use.

22-279. **Arc Welding Low Alloy High Tensile Structural Steel.** J. G. Ball. *Welding,* v. 12, May '44, pp. 223-232.

Weldability and recommendations as to technique. 3 ref.

22-280. **Arc Welding Electrodes.** W. Andrews. *Welding,* v. 12, May '44, pp. 245-248.

Compositions, properties, and applications.

22-281. **Electrode Pressure.** E. Leede. *Welding,* v. 12, May '44, pp. 249.

Use of a gage for accurate determination.

22-282. **Intricate Machine Parts.** A. E. Bedell and T. G. Morrison. *Steel,* v. 114, June 26, '44, pp. 90-92, 94, 139.

Fabricated by joining simple geometric elements cut from sheets, plate, shapes or piping. Proper design and sequence of assembly important.

22-283. **Developments in Use of Brazing in Production of Stamped Products.** *Steel Processing,* v. 30, June '44, pp. 355-357, 383.

New developments in the use of low and high temperature brazing for the joining of two or more stampings of like or different metals and its value in postwar planning.

22-284. **All-Welded Barges Feature Fabricating Operations at Warren City Manufacturing Company.** *Steel Processing,* v. 30, June '44, pp. 366-367, 385.

Production of LCM-3 barges; parts preparation division; welding division; X-ray department; shot blast and sand blast departments; heat treating division; machining division; assembly division; highlights.

22-285. **Recent Progress in the Application of Welding to Steel.** Wendell F. Hess. *Steel Processing,* v. 30, June '44, pp. 370-371, 392.

Factors affecting the successful application of welding. 5 ref.

22-286. **Hard-Surfacing by Welding.** C. R. Whittemore. *Canadian Metals and Metallurgical Industries,* v. 7, June '44, pp. 42-46, 61.

Types of wear; processes for applying hard-surfacing materials; the oxy-acetylene flame; oxy-acetylene process; electric arc welding; classes of hard-facing materials; properties of class III hard-facing materials—cobalt-chromium-tungsten, factors controlling welding rod quality.

22-287. **Ferrous Electric Welding—Fact and Fable.** D. Bruce Johnston. *Iron & Steel Engineer,* v. 21, June '44, pp. 45-56, 63.

Historical development, electric arc welding, bare

wire, covered wire, rod coatings, D-C versus A-C, automatic arc welding, atomic hydrogen, flash welding.

22-288. **Welding Aluminum and Its Alloys.** *Oxy-Acetylene Tips,* v. 23, July '44, pp. 69-74.

Fundamental principles for welding aluminum sheet, plate, and castings.

22-289. **Safety in the Welding and Cutting Industry.** *Oxy-Acetylene Tips,* v. 23, July '44, pp. 77-78.

A review of the acetylene industry's program for preventing welding and cutting fires and accidents.

22-290. **How to Adjust the Welding Flame.** *Oxy-Acetylene Tips,* v. 23, July '44, pp. 80-83.

Fundamental principles and correct adjustment of the oxy-acetylene flame.

22-291. **Elimination of Waste.** *Oxy-Acetylene Tips,* v. 23, July '44, p. 84.

Practical ideas for saving oxygen and acetylene.

22-292. **Cast Iron Oil Blending Kettle Enlarged by Bronze-Welding.** *Oxy-Acetylene Tips,* v. 23, July '44, p. 87.

This successful application demonstrates how a complicated job can be made simple by bronze-welding.

22-293. **Erie Welds Otisville Tunnel Rails in Track by Thermit Full-Fusion Process.** *Railway Engineering and Maintenance,* v. 40, July '44, pp. 608-611, 614.

Using a new-type weld and doing the work in place, this road has connected the rails in the eastbound track in its mile-long Otisville tunnel into continuous lengths. Characteristics of the weld and the manner it was installed in the tunnel described.

22-294. **Flame Cutting of Steel.** P. Grassmann and R. Bechtle. *Z. Ver. deut Ing.,* v. 87, 1943, pp. 603-604; *Engineers' Digest,* v. 1, June '44, pp. 408-409.

Flame cutting is characterized in that the oxygen jet of the torch oxidizes the iron and then blows the molten oxide out of the cut thus made.

22-295. **A New Method for Welding Cables.** H. Gunther. *ETZ* v. 63, 1942, pp. 587-91; *Engineers' Digest,* v. 1, June '44, pp. 410-412.

Special feature of this method is that it consists of a butt welding process in an enclosed space, and that it can be regulated automatically. This makes possible the use of heavy welding currents which in turn results in short welding times.

22-296. **Welding Meets War's Demands for High-Speed Production of Machine Equipment.** William J. Conley. *Modern Industrial Press,* v. 6, June '44, p. 28.

The development of arc welding as a modern tool for mass production demonstrated by the unprecedented output of ships, planes, tanks, guns and other major military items produced today. But behind the vast development of war industry, lies a remarkable example of manufacturing skill and ingenuity in turning out the machine tools necessary to make this fighting equipment.

22-297. **Arc Welding Electrodes.** W. Andrews. *Welding,* v. 12, June '44, pp. 266-270.

Compositions, properties, and applications. 15 ref.

22-298. **"Storage Battery" Welding.** *Welding,* v. 12, June '44, pp. 271-272.

Employing storage batteries to provide welding current developed in the U. S. New equipment is specially suited for work on Al parts in aircraft assembly. This system is claimed to possess several important advantages.

22-299. **The Replacement of Castings.** J. K. Johannesen. *Welding,* v. 12, June '44, pp. 273-276.

Superiority of welded fabrications.

22-300. **Gas Welding of Aluminum.** P. L. Pocock. *Welding,* v. 12, June '44, pp. 282-287.

Technique.

22-301. **Tests on Mild Steel Electrodes.** D. M. Kerr. *Welding,* v. 12, June '44, pp. 282-287.

Results of a series of tests carried out on varying types and sizes of mild steel electrodes to determine weight of weld metal deposit and melt-off rates.

22-302. **The Spot Welding of Light Alloys.** R. F. Tylecote. *Welding,* v. 12, June '44, pp. 298-305.

Machines and methods, surface preparation, electrodes.

22-303. **Weldability of Steel.** *Metal Progress,* v. 46, July '44, pp. 67-73.

Deviations in Predicted Weldability by Lehigh and Rensselaer Systems, by Daniel Rosenthal; Hot Cracks Versus Cold Cracks—to Distinguish them in Welded Joints, by Gerard H. Boss; Weldability—a More Complete Definition, by Osst. I. Temper.

22-304. **Special Shapes for Welding Designs.** W. J. Conley. *Steel,* v. 115, July 10, '44, pp. 88-89, 130.

Production of steel shapes such as sheets and plates, bars, structurals, piping and tubing in forms more readily adaptable for fabrication into assemblies by welding are advocated. Typical range of sizes suggested.

22-305. **The Joining of Metal.** J. Aherne-Heron and L. N. Smith. *Iron Age,* v. 154, July 13, '44, pp. 59-60.

Various methods of joining light alloys compared with each other. Possibilities for developing new forms of joining which would well repay investigation.

22-306. **D. & S. L. Renews Tunnel Rail.** *Railway Age,* v. 117, July 15, '44, pp. 108-111, 123-124.

Develops new full-fusion Thermit welds, use of a special rail section to offset corrosion and radiographs to check soundness of all welds.

22-307. **Metallurgy of Wiped Solder Joints.** G. S. Phipps. *Bell Laboratories Record,* v. 22, July '44, pp. 472-476.

By wiping off all of the solder in excess of a fillet, many causes of porosity can be eliminated. 60% less solder is required by the new joint, and splicers find it easier to make. New method depends on the characteristic behavior of lead-tin alloys in the process of freezing.

22-308. **A Discussion of Some of the Factors that Affect Welding in Shipbuilding.** R. O. Waldman. *Wire & Wire Products,* v. 19, July 44, pp. 426-427.

Welding electrodes and coatings; type of steel used; stresses and strains set up by welding.

22-309. **Electrical Bonding in Airplanes.** W. H. Arata. *Aero Digest,* v. 45, June 15, '44, p. 120.

Good electrical bond has a resistance approximately equal to that which would obtain if the two parts were integral. Purposes served by bonding are: Reduction of lighting hazards, prevention of shock to personnel when the plane lands and avoidance of sparking near gas tanks. Lockheed Aircraft Corp. standards and specifications by which bonding is regulated described.

22-310. **Atomic Hydrogen Arc Welding.** W. J. Van den Akker. *Steel,* v. 115, July 17, '44, pp. 114, 116, 166.

Aids joining of thin sheet in aircraft production.

22-311. **Repairing Cracked Cylinder Blocks by Electric Bonding.** L. E. Kunkler. *Steel,* v. 115, July 17, '44, pp. 125, 182, 184.

Combination of specially designed spot welding transformer, pure Ni electrodes deposited with vibrating motion, and colloidal solution effective in repair work. Method eliminates high temperatures which set up stresses, and avoids recrystallization.

22-312. **Welding for Postwar Construction—Discussion.** Van Rensselaer P. Saxe. *Iron Age,* v. 154, July 20. '44, pp. 73, 146.

Ship structures compared, owner influence.

22-313. **Applying HSS and Cast Alloy Welding Rod to Tool Manufacture and Salvage.** Albert W. Ehlers. *Tool & Die Journal,* v. 10, July '44, pp. 91-95.

Tool salvage and repair, an emergency repair, welded construction of form tools.

22-314. **Automatic Welding of NAX 9115 Sheet.** A. H. Scheffer. *Industry & Welding,* v. 17, July '44, pp. 33-35.

A light gage metal is required for oxygen breathing tanks used in combat aircraft. NAX 9115 steel (0.40 and 0.50 gage) replaced critical alloys and atomic hydrogen welding was used. Burst pressure tests run up to 100 psi.

22-315. **Silver Brazing 4.2 Mortar Shells.** *Industry & Welding,* v. 17, July '44, pp. 36-37, 40.

Brazing nose adapters to 4.2 chemical mortar shells by means of high frequency induction.

22-316. **Causes of Variation in Welding Current.** Joseph S. Wright. *Industry & Welding,* v. 17. July '44, pp. 41-42.

How to get the right heat for the job and keep it from fluctuating.

22-317. **The Control of Quality Workmanship III.** Robert Burnett. *Industry & Welding,* v. 17, July '44, pp. 44, 46, 80.

Proper training of welders, defects, undercutting, speed of welding.

22-318. **Design for Welding.** F. W. Sykes. *Industry & Welding*, v. 17, July '44, pp. 62-64, 66-73.
Fundamentals.

22-319. **Fabrication and Welding of Exhaust Manifolds.** C. D. LaFond and J. R. Plautz. *Welding Journal*, v. 23, June '44, pp. 501-504.
Manufacture and welding of manifold and a review of the problem from the designer's viewpoint.

22-320. **The Measurement and Prevention of Eye Flash.** Philip Drinker. *Welding Journal*, v. 23, June '44, pp. 505-506.
Standards for protective glass; distance and exposure for 'arc flash" injury; measuring dosage by light meter; workers must be properly protected. 4 ref.

22-321. **Repair and Maintenance of Tools.** T. B. Jefferson. *Welding Journal*, v. 23, June '44, pp. 506-511.
Maintenance of tools and equipment by the use of welding, cutting, metal spraying and related welding processes.

22-322. **Welding of Railroad Transport Equipment.** Charles O. Druetzler. *Welding Journal*, v. 23, June '44, pp. 512-516.
Construction and procedures used in arc welding the General Motors diesel electric freight locomotives.

22-323. **How to Select Electrodes for High-Quality Vertical and Overhead Work.** H. O. Westendarp. *Welding Journal*, v. 23, June '44, pp. 516-517.
A. W. S. classes E6010 and E6011 vs. E6012 and E6013.

22-324. **Practical Ways to Improve Machine Cutting.** H. H. Moss. *Welding Journal*, v. 23, June '44, pp. 518-524.
Nozzle selection, flame adjustment, starting the cut, per cent of lag, characteristics of kerf, bevel cuts.

22-325. **Coast Guard Inspection of Welding in Shipbuilding.** R. D. Schmidtman. *Welding Journal*, v. 23, June '44, pp. 525-528.
Historical sketch of welded shipbuilding in Coast Guard; Coast Guard welding standards; training and experience of inspectors. Approval of plans, review and approval of the welding sequence, qualification of the welding process or processes, qualification of welding operators, inspection of production welding, post-welding tests.

22-326. **The Theory and Use of Specifications to Expedite and Control Production.** O. R. Sutherland. *Welding Journal*, v. 23, June '44, pp. 529-532.
Things essential to the proper preparation and use of specifications.

22-327. **"Arc Flash" Conjunctivitis.** Forrest E. Rieke. *Welding Journal*, v. 23, June '44, pp. 533-536.
New problems for employees and physicians, eye complaints rank high, nature of the injury, statistics on arc flash eye injuries, a typical case, confusion from records, treatment, shipyard program. 2 ref.

22-328. **Weldable Steel Castings.** Welton J. Crook. *Welding Journal*, v. 23, June '44, pp. 257-S-271-s.

Weldability bead test; relation between Brinell hardness and tensile strength; characteristics of steel castings produced by various foundries; physical properties; weldability tests; macrostructure of weld beads; depth of penetration and depth of heat-affected zone; the physical properties of metal in the heat-affected zone, welded cast steel specimen material; physical properties; method of test; bead applications; location of tensile specimens.

22-329. **Selective Copper Brazing in Salt Baths.** *Industrial Heating,* v. 11, July '44, pp. 1099-1100.

Electric salt bath furnaces which not only permit the selective heating of the parts to be brazed, but also eliminate decarburization, and have reduced scrap from 15% to a maximum of 3%.

22-330. **Factors Affecting the Strength of Soldered Joints Made From Electrotinned Steel Sheet.** A. W. Hothersall, D. W. Hopkins, and G. L. Evans. Iron & Steel Institute, Advance Copy, Feb. '44, 18 pp.

Effect of the method of cleaning steel sheet in preparation for electro-tinning on the strength of soldered joints, using a tearing test; effect on the joint strength of the weight of tin coating, the time of storing the plated sheet before soldering and the type of solder.

22-331. **The Facts About Welding.** *Modern Industry,* v. 8, July 15, '44, pp. 46-50, 52, 54, 56, 58, 60.

Does it stand up? What causes troubles? Can it cut costs? Clarifying answers to such questions package some practical ideas.

22-332. **Hard-Surfacing by Welding. II.** C. R. Whittemore. *Canadian Metals & Metallurgical Industries,* v. 7, July '44, pp. 39-42.

Materials which can be hard-faced; hard-facing steel and its alloys; design and preparation of machine parts; applications of class 3 hard facing materials. 21 ref.

22-333. **Spot Welding SO and ST Materials.** Jack L. McGraw. *Modern Industrial Press,* v. 6, July '44, pp. 24, 26.

This method of pressure welding by spot welding SO and ST materials together, when hole coordination or circumstances demand it, has been proven, put into practice, and not a part has been lost due to lack of hole coordination or faulty spot welding.

22-334. **Automatic Welding for "Victory" Ships.** M. H. MacKusick. *Western Metals,* v. 2, July '44, pp. 24-25.

Automatic welding at Calship is done by the well known "Union-Melt" process, using bare electrode wire in coils fed by an automatic machine.

22-335. **Welded Ships Without Distortion.** M. Q. Cellers. *Welding Engineer,* v. 29, July '44, pp. 35-39.

What causes those perplexing and troublesome locked-up stresses? Can they be avoided? How?

22-336. **A Modern Welding Department.**. Thomas R. Hough. *Welding Engineer,* v. 29, July '44, pp. 40-43.

A clean, light and well ventilated working area, but it paid big dividends.

22-337. **Shadows of the Future.** T. B. Jefferson. *Welding Engineer,* v. 29, July '44, pp. 44-47.

Will plastics displace steel and non-ferrous materials in the postwar era? What will be the effects on industry? On welding? Who will use welding after the war?

22-338. **Arc Welding Cast Iron.** Charles Carter. *Welding Engineer,* v. 29, July '44, pp. 48-49.

No single type of electrode is "best" for cast iron welding. Different types of electrodes and procedures are required for different jobs. Helpful hints on when to use what.

22-339. **Saving Dollars for Foundries.** George Bellew. *Welding Engineer,* v. 29, July '44, p. 50.

Machine flame-cutting greatly reduces grinding in the removal of risers from castings. So smooth are many cuts that no grinding at all is necessary. No gouges to be filled in.

22-340. **Welded Drums on the Spot.** Fred B. Barton. *Welding Engineer,* v. 29, July '44, p. 51.

On-the-spot welding is something new.

22-341. **Underwater Cutting of Metal.** M. F. Rodman. *Welding Journal,* v. 23, July '44, pp. 603-609.

Difficulties, basic principles and applicability of the process.

22-342. **Metallic Arc-Welding Electrodes.** Harold Lawrence. *Welding Journal,* v. 23, July '44, pp. 610-621.

Fundamental information necessary to demonstrate how electrodes may be classified. Engineering service further influences electrode choice. Class E6010, E6011 and E6012 electrodes discussed.

22-343. **Sectional Ship Erection Welding Sequence.** Alfred E. Wallen. *Welding Journal,* v. 23, July '44, pp. 622-623.

Care should be taken to see that all major internal welding in each section be completed prior to their being welded together as a part of the ship.

22-344. **Hints on Silver Brazing.** H. H. Griffith. *Welding Journal,* v. 23, July '44, pp. 624-626.

Physical properties; flux is essential; use proper heat; corrosion resistance.

22-345. **Three-dimensional Lofting as an Aid in Jig Construction.** John W. Clerket. *Welding Journal,* v. 23, July '44, pp. 626-629.

Standardization of jig and fixture parts, and the development of three-dimensional lofting form, made it possible to attain economical manufacture of this complicated steel truss.

22-346. **Unique Jig Speeds Welding of Canteens.** W. F. Lautner. *Welding Journal,* v. 23, July '44, pp. 630, 631.

The average weld is completed in one minute twelve seconds.

22-347. **Mechanical Characteristics of Resistance Welds in Plain Carbon Steels.** *Welding Journal,* v. 23, July '44, pp. 309s-343s. 88 ref.

Summarizes the information available on the major variables affecting the mechanical properties of welds

made in plain carbon steels by the resistance welding method.

22-348. **A Paper on Multi-Arc Welding of Aluminum Alloys.** Malcolm R. Rivenburgh and C. Weston Steward. *Welding Journal*, v. 23, July '44, pp. 344s-350s.

The essential elements of the process are: A twin carbon torch, a heavily coated metallic electrode, a metallic electrode holder, the part to be welded and two sources of current.

22-349. **Precambering Technique in Welding Fabrication of Hatch Covers.** Gerald Eldridge Stedman. *Steel Processing*, v. 30, July '44, pp. 421-424.

Hatch covers, production line, welding, precambering, channel and final positioner jigs, gear reduction drive on final positioner, assembly jig.

22-350. **Recent Progress in the Application of Welding to Steel.** Wendell F. Hess. *Steel Processing*, v. 30, July '44, pp. 430-431, 435.

Design of structure from the standpoint of rigidity and thickness of material. Methods of solving specific problems with various welding processes.

22-351. **Surface Conditioning for Spotwelding Aluminum.** Thomas E. Piper. *Light Metal Age*, v. 2, July '44, pp. 12-13.

A new proven technique, which combines preparatory cleaning and etching into one operation, and which has removed over fifty per cent of the spot welding trouble at Northrop Aircraft Co. It has permitted extremely long runs without requiring tip cleaning, and has opened the door to production spot welding.

22-352. **Welding and Cutting Adapted to Line Production.** Forrest Waldo. *Iron Age*, v. 154, August 3, '44, pp. 52-58.

A monorail conveyor is used to carry the beams from one work station to the next, and as much as possible the performance of each operation is so planned as to minimize or eliminate the possibility of workers getting ahead of schedule or the building up of surplus stocks at any stage of fabrication.

22-353. **Welded Diesel Manifold.** B. E. Vankrimpen. *Welding Engineer*, v. 29, August '44, pp. 27-29.

A highly complicated assembly successfully held to 1/16 in. tolerance in a 10-ft. length by precision welding. Helixhaust manifold.

22-354. **Beveling Tube Intersections.** T. B. Jefferson. *Welding Engineer*, v. 29, August '44, pp. 30-31.

Northern Ordnance Inc. designed a special flame-cutting machine that cuts a true cylindrical intersection and leaves a beveled edge in the tubing.

22-355. **"Nervous Weld" Process.** Clyde B. Clason. *Welding Engineer*, v. 29, August '44, pp. 32-33.

A new type of welding developed to plug blowholes or otherwise add metal to salvage castings—particularly aluminum.

22-356. **Building with Steel Tubing.** *Welding Engineer*, v. 29, August '44, pp. 34-36.

Lower costs and lesser weight are two of the reasons

for today's trend towards the use of welded tubing for structural purposes.

22-357. **Stress-Relief Welding.** Glenn F. Crosiar. *Welding Engineer,* v. 29, August '44, p. 37.

Longitudinal stresses in welded ship plates can be greatly reduced by a method providing outlets for the escape of stresses.

22-358. **Skip Welding Thin Stainless.** Joseph S. Wright. *Welding Engineer,* v. 29, August '44, p. 41.

Preventing buckling and warping of 1/16-in. thick stainless steel sheets used in the fabrication of a cowl 12 ft. in diameter.

22-359. **Welded Ship Okayed.** *Welding Engineer,* v. 29, August '44, pp. 42-44.

Investigation of the design and methods of constructing welded steel merchant vessels. Poor loading and ballasting, heavy seas and low temperatures were found to contribute materially to structural distress.

22-360. **Silver Brazing of Tools and Gages.** Frederic L. Woodcock. *Metals & Alloys,* v. 20, July '44, pp. 78-82.

Used for repair and rehabilitation of broken and worn tools, dies and gages and for the construction of new tipped tools. Applications of both types and details of operating technique. 4 ref.

22-361. **Nervous Welding.** L. E. Kunkler. *Steel,* v. 115, August 7, '44, pp. 92, 94.

The process employes a low voltage, high amperage welder in combination with compressed air and a vibrator and is especially adapted for use in plugging holes and cracks in steel, gray iron, malleable and Al bronze castings. The process also may be used for adding metal to internal and external diameters for press fit applications.

22-362. **Selective Copper Brazing in Salt Bath Furnaces.** *Iron Age,* v. 154, August 10, '44, p. 51.

Process employs electric salt bath furnaces which permits the selective heating of the parts to be brazed, eliminates decarburization, and has reduced scrap from 15% to a maximum of 3% as compared with conventional methods.

22-363. **Copper Brazing as a Production Tool.** C. L. Hibert. *Automotive & Aviation Industries,* v. 91, August 1, '44, pp. 32-35, 67-68, 70, 74, 76, 78.

Technique, material, applications and physical strength of copper brazed joints.

22-364. **Forming and Welding Curtiss Hollow Steel Propeller Blades.** Holbrook L. Horton. *Machinery,* v. 50, August '44, pp. 170-180.

Press working and welding hollow steel propeller blades described.

22-365. **Joining Aluminum Alloys.** E. C. Hartmann, G. O. Hoglund, and H. A. Miller. *Steel,* v. 115, August 14, '44, pp. 102, 148, 150, 152, 154, 156.

Gas welding works well in joining sections from 0.025 to 1 in. thick.

22-366. **Exhaust Manifolds for Flying Forts.** *Industry & Welding*, v. 17, August '44, pp. 40-43.

Automotive methods speed production. Welding increased wear ring production and reduced production time of collector ring tail by 23 min.

22-367. **Redesign of Hoist Equipment.** *Industry & Welding*, v. 17, August '44, pp. 44-47.

Post-war welding outlook.

22-368. **Well Begun . . . More Than Half-Done.** R. G. Hawley. *Industry & Welding*, v. 17, August '44, pp. 48-49, 94-97.

The various steps taken in setting up for the gun mount job.

22-369. **Oxy - Acetylene Pipe Line Systems - I.** D. F. Guthrie and R. W. Stewart. *Industry & Welding*, v. 17, August '44, pp. 56-60.

Reasons for, and methods of establishing pipe line systems in large plants.

22-370. **Keeping Boilers in Action.** *Industry & Welding*, v. 17, August '44, pp. 66-67.

Development of stud welding makes it applicable in the boiler plant.

22-371. **Structural Failures in Welded Ship Construction (Tentative).** Report of Subcommittee on Hull Construction, Committee on Welding in Marine Construction, American Welding Society, 1944, 9 pp.

Principal factors causing failure; definitions of residual stresses, reaction stresses, stress concentrations; means to reduce residual stresses; general precautions relative to reaction stresses; plate fractures in cold weather; metallurgical considerations; engineering control.

22-372. **Weldability Standards for Alternate Aircraft Steels (Tentative).** Prepared by Aircraft Welding Standards Committee, American Welding Society, 1944, 14 pp.

Tee-bend test; transverse butt-joint tension tests of ¼-in. plate, 18-in. sheet, and 1-in. tubing; welded double-tube triangle test. Use to compare proposed alternate steels with standard aircraft steels.

22-373. **Resistance Welding in Aircraft.** O. A. Perry and H. D. Hager. *Iron Age*, v. 154, August 17, '44, pp. 66-71.

Speeded production by developing multiple spot-welders for the tack assembly of stainless steel ammunition boxes and chutes, and an index spot-welder for landing flap deflectors. Collet type dies have been developed for the concentric alignment of tubing for flash welding.

22-374. **Electrodes for Welding Aluminum Bronze.** *Engineering*, v. 158, July 21, '44, p. 48.

Electrode for welding aluminum bronze introduced under the trade name Murex "Bronalex". This electrode deposits metal containing approximately 10% aluminum, 4% iron, and 4% nickel. The tensile strength of the weld metal is of the order of 37 to 41 tons per sq. in. and the crystal size of the weld is much finer than that existing in castings.

22-375. **Bogie Bracket Support Assemblies.** W. Tindall. *Welding,* v. 12, July '44, pp. 310-314.
Fabrication of components for British tanks.

22-376. **The Welding Manipulator.** I. R. Waller. *Welding,* v. 12, July '44, pp. 322-326.
Uses and advantages of modern handling equipment.

22-377. **Arc Welding of Magnesium Aircraft Structures.** V. H. Pavlecka and John K. Northrop. *Welding,* v. 12, July '44, pp. 327-332.
Newly developed method of arc welding magnesium aircraft structures using the "Heliarc" process.

22-378. **The Spot Welding of Light Alloys.** R. F. Tylecote. *Welding,* v. 12, July '44, pp. 344-349.
Refrigeration, strength properties, tension and tearing, fatigue, structural properties and stress distribution, cold working, corrosion, metallurgy, macrostructure, microstructure, the design of joints and the spacing of welds. 6 ref.

22-379. **All-Welded Tank Cars.** Albin Anderson. *Railway Mechanical Engineer,* v. 118, August '44, pp. 353, 361.
Cars differ in design and construction from standard tank cars. In Olsson cars practically the whole structure is welded. No separate underframe, merely at each end, a fixed, two-wheel frame welded to the tank and consisting of bearing forks, buffer beam, draw box and cross members. These end parts carry the buffers, draw gear, spring suspension, and brake devices.

22-380. **Flame Filled Future.** Daniel Minturn. *Scientific American,* v. 171, Sept. '44, pp. 103-105.
Oxy-acetylene flames, once thought to have extremely limited uses, are branching out as versatile tools in the metal-working industry.

22-381. **Spot Welding Heavy Steel Sections.** Fred A. Lee. *Steel,* v. 115, August 21, '44, pp. 98-101, 144, 146, 148, 150, 152.
Departures from conventional practice make joining of alloy steel plate a fairly simple procedure in fabrication of Army half-tracs.

22-382. **Joining Aluminum Alloys.** E. C. Hartmann, G. O. Hoglund and M. A. Miller. *Steel,* v. 115, August 21, '44, pp. 110, 113, 116, 156, 158, 160, 162.
Variations in arc-welding procedure, including metal arc, carbon arc, carbon torch, tungsten arc, atomic hydrogen, automatic and semi-automatic carbon arc.

22-383. **Repair and Maintenance of Tools by Welding.** *Canadian Metals and Metal Industries,* v. 7, August '44, pp. 32-35, 52.
Silver brazing applications; applying carbide tips; silver brazing procedure; brazing temperature is critical; atomic hydrogen applications; reclaiming high-speed drills; lathe tools repaired; welding high-speed broaches.

22-384. **New Process Bonds Aluminum Cooling Fins to Steel Cylinder Barrels.** *Industrial Heating,* v. 11, August '44, pp. 1270, 1272.
The Al-Fin makes possible marked reduction in the

structural weight of an aircooled engine and greatly improves the cooling efficiency of its cylinders.

22-385. **Welding and Production.** J. Henderson. *Engineering,* v. 157, June 23, '44, pp. 497-499.

A general picture of some of the methods available, their applications and limitations, and the necessity for the closest co-operation between the designer, the welding engineer and the production engineer.

22-386. **Recent Progress in the Application of Welding to Steel. II.** Wendell F. Hess. *Steel Processing,* v. 30, August '44, pp. 501-503.

Examples for arc welding and for electric resistance spot welding to illustrate the steps involved in the determination of proper welding conditions.

22-387. **Controlled Atmosphere Furnace Brazing.** A. K. Phillippi. *Steel Processing,* v. 30, August '44, pp. 517-519.

Design of articles for brazing; methods of joining parts; types of brazing furnaces.

22-388. **Joining Aluminum Alloys.** E. C. Hartmann, G. O. Hoglund and M. A. Miller. *Steel,* v. 115, August 28, '44, pp. 96, 99, 100, 124, 126.

Brazing procedure. Sections from 0.006 to ½ in. may be readily joined. Physical properties and design factors discussed.

22-389. **Tooling for Magnesium Welding.** Kenneth L. Kime. *Iron Age,* v. 154, August 31, '44, pp. 33-40.

Analysis of hold down devices, stiffeners and other tool elements. Illustrates the adaptability of heavy drop hammer dies for the bases of the welding jigs.

22-390. **Copper Brazing.** T. L. Davies. *Aircraft Production,* v. 6, July '44, pp. 346-351.

Process for building up components. Brazing process; method of procedure; strength of brazed parts; joint clearances; distortion; suitable materials; gas atmospheres; practical applications; airscrew spider.

22-391. **Welding Fixtures. II.** Harold B. Pereira. *Aircraft Production,* v. 6, July '44, pp. 352-354.

Production of a tubular engine mounting for an in-line power unit.

22-392. **Welding and Production.** J. Henderson. *Engineering,* v. 157, June 30, '44, pp. 517-519.

Designing for arc welding.

22-393. **Foundry Mold Jackets Assembled by Welding.** Roger Vander Velden. *Foundry,* v. 72, Sept. '44, p. 136.

Making mold jackets which support the sand after the mold has been stripped from the machine flask and while the molten metal is being poured.

22-394. **Heat Shock Testing.** *Westinghouse Engineer,* v. 4, Sept. '44, pp. 142-143.

Uses a resistance welder to make an accelerated heat-shock test on alloy samples of simple shape.

22-395. **Flame Cutting Under Water.** George R. Reiss. *Steel,* v. 115, Sept. 4, '44, pp. 80-81, 136, 138.

Eliminates problem of distortion, avoids straightening operations, affords closer tolerances, cuts down amount of excess metal that must be allowed and thus reduces cost of finish machining.

22-396. **Joining Aluminum Alloys.** E. C. Hartmann, G. O. Hoglund and H. A. Miller. *Steel*, v. 115, Sept. 4, '44, pp. 102, 105-106, 140.

Soldering has been considered least as a method of joining light alloys, yet it comprises an excellent fabricating process in many instances. Where resistance to corrosion is a factor, other types of joining are advised. Previous articles covered riveting, welding and brazing.

22-397. **Test of ½-Continuous Welds to Replace 3-In. Intermittent Welds. I.** M. H. MacKusick. *Welding Journal*, v. 23, August '44, pp. 685-691.

Long increment welds can be substituted for conventional 3-in. increment welds for the purpose of securing stiffeners to ships' plating. Long increment welds of equivalent strength will behave under pressure loading in a similar manner to 3-in. conventional welds.

22-398. **Stresses in Fillet Welds with Eccentric Loads.** M. F. Spotts. *Welding Journal*, v. 23, August '44, pp. 692-695.

Method of computing the stress briefly reviewed. Method extended to the case of fillet welds carrying moment loads. Use of this latter method illustrated by numerical examples. 2 ref.

22-399. **Resistance Welding Equipment—Designed for Production.** Clyde F. Kaunitz. *Welding Journal*, v. 23, August '44, pp. 696-697.

Fundamentals of the welding machine.

22-400. **Metallic Arc-Welding Electrodes. V.** Harold Lawrence. *Welding Journal*, v. 23, August '44, pp. 698-709.

Class E6013 electrodes; Class E6020 and E6030 electrodes; Class E7010 electrodes; Class E7020 electrodes.

22-401. **Proposed Recommended Practices for Resistance Welding.** *Welding Journal*, v. 23, August '44, pp. 713-717.

Recommended practice for the spot, seam and pulsation welding of low carbon steel (including coated steels), and spot and seam welding of stainless steel.

22-402. **Controlled Low Temperature Stress Relief.** T. W. Greene and A. A. Holzbaur. *Welding Journal*, v. 23, August '44, pp. 369-s-371-s.

Results of the investigation of the controlled low temperature stress relief prove that the residual welding stresses can be effectively reduced, and that the operation can be performed quickly, efficiently and economically on the critical welded joints in a ship.

22-403. **The Spot-Welding Properties of Rust-Proofed Mild Steel Sheet.** W. S. Simmie and A. J. Hipperson. *Welding Journal*, v. 23, August '44, pp. 371-s-375-s.

Objects: To determine which surfaces permitted satisfactory spot welding; study the effect of the spot-welding process on the corrosion resistances of those surfaces which permitted satisfactory spot welding; examine the effect of each surface which permits satisfactory spot welding on the life of the welding electrode tips; determine the effect of those surfaces permitting spot welding on the strength of weld produced.

22-404. **Determination of Cooling Rates of Butt and Fillet Welds as a Result of Arc Welding with Various Types of Electrode on Plain Carbon Steel.** W. F. Hess, E. F. Nippes, L. L. Merrill and A. P. Bunk. *Welding Journal,* v. 23, August '44, pp. 376-s-391-s.

The cooling rates resulting from welding with austenitic electrodes on mild steel plate are essentially the same as those obtained by welding at the same values of energy input with mild steel electrodes on mild steel plate. The cooling rates resulting from the making of butt welds at the same energy input with a variety of plain low carbon and alloy steel rods on 1-in. plate at 72° F. are identical, regardless of the type of electrode used. The cooling rates associated with the making of butt welds using bare electrodes are essentially the same as those obtained with shielded type electrodes.

22-405. **Magnetic Oscillograph Equipment for Development of Aluminum Alloy Spot Welding and Production Control of Welding Machines.** G. W. Scott and A. A. Burr. *Welding Journal,* v. 23, August '44, pp. 392-s-401-s.

Oscillograph to measure the important variables involved in the spot or seam welding of light alloys such as aluminum or magnesium. Used to determine the optimum production spot-welding procedure; to study spot-weld consistency; to increase spot-welding rates without sacrificing consistency; to make welding machine dial calibrations; to isolate trouble quickly in case of poor welding or actual breakdown; and to make a routine monthly check. 2 ref.

22-406. **Value of Preheating in Welded Ship Construction.** James W. Wilson. *Welding Journal,* v. 23, August '44, pp. 414-s-416-s.

Analysis of failures on vessels built under adverse weather conditions. Endeavor to eliminate the tendencies to cracking by applying heat treatment to the metal. Preheating is only method practicable in ship welding.

22-407. **The Welding of Light Alloys.** I. H. Hogg. *Metal Treatment,* v. 11, Summer '44, pp. 71-82.

Considerations affecting the use of welding for light alloys, some methods available for performing the duty, and a few matters requiring attention in practice. As fusion welding is already generally well known, consideration is given mainly to the innovations concerned with spot welding. 2 ref.

22-408. **Hydrogen and the Weld Cracking of Alloy Steels.** G. L. Hopkin. *Metal Treatment,* v. 11, Summer '44, pp. 125-130.

Experiments are described which demonstrate that hydrogen plays a very important part in causing cracking and appears to be the factor mainly responsible for the different results obtained with different electrodes when other conditions are constant. 4 ref.

22-409. **Conveyor Boosts Welding Output by 70 Per Cent.** *Iron Age,* v. 154, Sept. 7, '44, pp. 78-80.

With this welding conveyor system built along simple lines eight welders are able to meet the high produc-

tion rate of 145 lift truck tower assemblies per week, aided only by two helpers in place of the eight helpers previously required.

22-410. **Cut Gates and Risers Closely.** George Bellew. *Metal Progress,* v. 46, Sept. '44, p. 487.

A special machine for flame cutting gates and risers from heavy circular castings; better than hand cutting because it makes a closer marginal cut, leaving only the barest minimum of metal to be ground off.

22-411. **Fracture Strains of Soldered Joints.** F. Berman & R. H. Harrington. American Society for Metals, 1944 Preprint, No. 39, 13 pp.

Small pieces of copper were soldered end to end under various conditions and were then bent at the joint to encourage fracture. In vacuum application, reheating of the joint in air, in the range of 500 to 700° C., will, upon subsequent fracturing, disclose oxidized surfaces, indicative of joints that would leak. Some copper to copper joints are best made with eutectic Ag-Cu alloy by soldering at 800° C., rather than at the conventionally higher temperatures.

22-412. **Brazing Aluminum Alloys.** *Canadian Metals and Metallurgical Industries,* v. 7, Sept. '44, p. 41.

Furnace brazing, torch brazing, dip brazing, cleaning joints after brazing.

22-413. **Welding Current Distribution System Saves Time and Space.** C. E. Schirmer. *Industry & Power,* v. 47, Sept. '44, p. 73.

Easily made conductor bars and insulating supporting brackets transmit welding current for instant use at various points in the shop.

22-414. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 115, Sept. 11, '44, pp. 98-101, 114, 146.

Features and applications of stainless steel electrodes.

22-415. **Joining Aluminum Alloys.** E. C. Hartmann and G. O. Hoglund. *Steel,* v. 115, Sept. 11, '44, pp. 116, 156, 158, 160, 162, 164.

Resin-bonding method for making metal-to-metal and metal-to-nonmetal joints. Successful for confidential war applications.

22-416. **Joint Preparation for Brazing of Tools.** *Industry and Welding,* v. 17, Sept. '44, pp. 35-37, 90-94, 96.

What to do to conserve a highly critical group of tool steel parts.

22-417. **Good Practices in the Operation of Acetylene Generators.** *Industry and Welding,* v. 17, Sept. '44, pp. 38-39, 62-64, 66.

Recommendations specifically directed to the shipbuilding industry, but applicable wherever acetylene generators are used.

22-418. **Drop-Off Tanks for Fighters.** *Industry and Welding,* v. 17, Sept. '44, pp. 40-41, 44, 101-103.

Laminar flow drop-off tank high production rate achieved by coordination of stationary and moving production lines.

22-419. **Speed to Strip.** *Industry and Welding,* v. 17, Sept. '44, pp. 48-50.

Welding shows the way in another industry.

22-420. **Oxy-Acetylene Pipe Line Systems for Large Plants.** *Industry and Welding,* v. 17, Sept. '44, pp. 58, 60-61, 84-89.

Contribution of the welding trade to heavy or production line industries; theory and practice followed in determining the correct pipe sizes for each load point.

22-421. **Wrecked Punch Press Ram Brazed with a Novel Procedure.** R. Kraus. *Industry and Welding,* v. 17, Sept. '44, pp. 45-47, 68, 70, 72-73.

The repair of a large cast iron ram and the reason why certain methods were applied.

22-422. **Worn Lathe Spindle Repaired by Welding.** *American Machinist,* v. 88, Sept. 14, '44, p. 97.

Worn section of the spindle was first turned down with the temporary cutting tool arrangement. The holder was fabricated from scrap steel parts welded together. The worn surface was built up with two passes of 5/32-in. shielded arc electrode for mild steel. The weld beads were laid longitudinally on the spindle.

22-423. **Low Temperature Welding Expedites Repairs.** Clinton L. Swift. *Aviation,* v. 43, Sept. '44, pp. 142-143.

Low melting point, high strength welding with Eutectic alloys saves gas and time, frequently permits much easier fabrication.

22-424. **Design Data for Spot Welds in Aluminum Alloy Sheets.** James Ralston. *Product Engineering,* v. 15, Sept. '44, pp. 608-611.

Welding principles and basic considerations that govern the design of spot welded parts made of aluminum alloy sheets are enumerated, with data pertaining to weldability of different aluminum alloys, mechanical properties of spot welded joints, gage combinations, spot spacing, edge distances and surface preparation.

22-425. **Welding Transformer Tanks.** H. W. Allison. *Welding Engineer,* v. 29, Sept. '44, pp. 38-39.

A large power-transformer tank must have permanent oil tightness and a mechanical strength capable of supporting from six to eight times its own weight; all-welded construction is being used to replace the older method of riveting.

22-426. **336 Liberty Ships.** Don Llewellyn. *Welding Engineer,* v. 29, Sept. '44, pp. 40-41.

It took 14,464 miles of welding to build the 336 Liberties completed by Calship in a period of 28 months.

22-427. **Cutting Cast Iron.** R. A. Brady. *Welding Engineer,* v. 29, Sept. '44, p. 41.

Cutting cast iron articles with an ordinary cutting torch.

22-428. **Welded Sternwheel Shaft.** *Welding Engineer,* v. 29, Sept. '44, pp. 49-50, 52.

Thermit welding used to repair a broken steel shaft 31 in. in diameter and weighing 40 tons.

22-429. **New Tips From Old.** Al Lake. *Welding Engineer,* v. 29, Sept. '44, pp. 54, 56.

Damaged welding and cutting tips are being recon-

ditioned for double and treble service by the use of specially built equipment in the tool room.

22-430. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 115, Sept. 18, '44, pp. 110-111, 166, 168, 170, 172, 174, 176.

Hard surfacing electrodes range in price from less than 20 cents to several dollars per pound but selection of more expensive types for many applications often is more economical.

22-431. **Helium Welding of Magnesium.** F. A. Wassell. *Steel,* v. 115, Sept. 18, '44, pp. 125-126, 128.

Process may be likened to carbon arc welding. Apparatus used consists essentially of a tungsten electrode and a gas nozzle or cup which surrounds the electrode.

22-432. **The Flash Welding of Alloy Steel—Metallurgical and Physical Characteristics.** J. C. Barrett. American Welding Society Preprint, Oct. '44.

Properties of flash welds in alloy steels; structural zones in a flash weld and the hardness values to be expected in these zones followed by a consideration of the properties to be expected in both as welded and heat treated welds. Upset fiber also discussed.

22-433. **Evolution of Welding in Shipbuilding.** M. N. Maltseff. American Welding Society Preprint, Oct. '44.

Value of streamlining and balancing of connection and joints. Shelter deck will, no doubt, have an entirely different appearance; no large square openings that abruptly change cross-sections of the deck plating to form hatches; gunwale will be eliminated. Welded hull presents a monolithic structure, so connections and joints should be simple and structurally balanced.

22-434. **Multi-Arc Welding of Aluminum Alloys.** M. R. Rivenburgh and C. W. Steward. American Welding Society Preprint, Oct. '44.

Essential elements of the process, its operation and function.

22-435. **Small Portable Condenser Welding Set.** E. M. Callender. American Welding Society Preprint, Oct. '44.

Description of a portable discharge welder and other related equipment such as the portable power plant; some discharge welder fundamentals covered, with especial reference to the influence of the welding transformer. Certain principles are brought out in relation to the method of "short time" welding employed in the discharge welder. Photographs of the equipment, photomicrographs of a weld etch, and a table of shear strengths for stainless steel; different modes of current discharge curves also included.

22-436. **Oxy-Acetylene Pressure Welding.** A. R. Lytle. American Welding Society Preprint, Oct. '44.

Technical and mechanical aspects of oxy-acetylene pressure welding.

22-437. **Development and Application of Modern Heavy Coated Arc Welding Electrodes.** D. C. Smith and W. G. Rinehart. American Welding Society Preprint, Oct. '44.

Development of electrode coatings by studying the

influence of various coating materials on the arc energy distribution between cathode and anode suggested as a means of evaluating the influence of possible coating materials on their arc behavior. An equal distribution of energy between cathode and anode is desirable for a.c. arc welding. Function of welding slags and how their melting point, density, viscosity and surface tension are used to control the fluidity and quality of the weld metal is pointed out.

22-438. **The Flash-Butt Welding of Alloy Steels—Welding Variables.** J. J. Riley. American Welding Society Preprint, Oct. '44.

Heating period of the weld designated as the flashing action is one of the principal actions to be controlled. The manner in which heating occurs, effect on the work-pieces with changes in rates of energy input, and recognition of correct settings of the machine characteristics to produce satisfactory flashing action discussed. Interpretation of recording meter records to judge the quality of the flashing action covered. Welding variables forming part of the upset action are studied and correlation of dimensional variables is presented in tabular form.

22-439. **Characteristics of Welding Arcs on Aluminum in Atmospheres of Helium and Argon.** F. A. Wassell. American Welding Society Preprint, Oct. '44.

Gas-shielded arc welding of aluminum without the use of flux, based on the use of argon and helium as atmospheres with either a-c or d-c as the power.

22-440. **The Geometry of a Spot Welding Tip and Its Relation to Tip Life.** E. D. Crawford and C. W. Steward. American Welding Society Preprint, Oct. '44.

In spot welding aluminum alloys, if the tip life could be appreciably increased, there would be a noticeable reduction in production costs and a more uniform quality of spot welds. A slightly raised, flat button produces remarkably good tip life.

22-441. **Standard Details for Welded Building Construction.** H. W. Lawson. American Welding Society Preprint, Oct. '44.

Principles of design for beams and their connections. Offers for simply supported beams, a set of welded details which with their capacities, are ready for handbook publication and general professional acceptance.

22-442. **Spotwelding Machines for Heavy Gages of Ferrous and Non-Ferrous Metals.** Mario Sciaky. American Welding Society Preprint, Oct. '44.

How the thickness of material affects the design of the welding machine; how the welders are constructed for heavy gages; characteristics of heavy gage welds.

22-443. **Some Observations on the Welding of Manganese High-Tensile Steels.** W. B. Brooks and A. G. Waggoner. American Welding Society Preprint, Oct. '44.

Study based on the all-weather welding of ¾-in. or heavier plates. Thirteen commercial manganese steels containing 0.14 to 0.20% C, 1.0 to 1.5% Mn with additions of vanadium or titanium were studied. They

had a pronounced tendency to cracking under normal welding conditions, and a highly variable hardenability as determined by the L-Jominy test. Ductility of the heat affected zone measured by the slow notch bend test.

22-444. **Fabrication and Reclamation in Steel Mill Maintenance.** E. W. Gruber. American Welding Society Preprint, Oct. '44.

Plant maintenance and construction work classified under the headings of replacement fabrication, original fabrication, reclamation and repair, and plant maintenance. Fabrication of internal combustion units, copper conductor rolls, complete equipment for oil reclamation, and caustic cleaning tanks by welding. Operation of flame hardening of mill rolls, restoration of worn bronze mill guides, lead burning and integration of lead castings in repairing or replacing lead parts on pickler tanks, and repairs to burned-out tin pots.

22-445. **Welding of Aluminum Tank Cars.** A. H. Woollen. American Welding Society Preprint, Oct. '44.

A welded tank built of Alcoa 35½H plate. Welding was accomplished by using oxy-acetylene, carefully preheating plates prior to welding. Progress accomplished in methods of welding, using the electronic tornado automatic system employing a wire electrode.

22-446. **Fundamentals of Heavy Cutting.** H. G. Hughey and G. L. Walker. American Welding Society Preprint, Oct. '44.

Typical records of cutting steel 12 in. thick and over, bringing out lack of complete information and reference to standards which permit adequate comparison. Emphasis placed upon adequate knowledge of capacity and general characteristics of the torches and tips. Data covering 12 to 36-in. material embodies variations of tip sizes, oxygen flows, oxygen pressures, and cutting speeds.

22-447. **Arc Welding Practices in the Steel Foundry.** Frank Kiper and Lawrence Gabes. American Welding Society Preprint, Oct. '44.

No alloy casting is welded in the as cast state. Rough machining of castings prior to welding eliminates much surface welding. Physical characteristic of heat and corrosion resisting alloys are different from those of steel and must be kept in mind when setting up a welding practice. Some safeguards against carbide precipitation given.

22-448. **The Oxy-Acetylene Process in the Steel Mill.** *Blast Furnace & Steel Plant,* v. 32, Sept. '44, pp. 1076-1079.

Oxy-acetylene operations discussed: Flame-conditioning, lancing operations, open hearth maintenance, machine cutting, and welding shop operations. Consideration of the oxygen piping system will be of assistance in visualizing how the oxy-acetylene process fits into production and maintenance operations.

22-449. **The Application of Arc Welding to Turret Lathe Production.** Henry A. Oldenkamp. *Machinery,* v. 51, Sept. '44, pp. 167-171.

Description of methods employed in the application of arc welding to machine tool building.

22-450. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel*, v. 115, Sept. 25, '44, pp. 86, 88, 130, 132, 134.

Excellent joints in cast parts can be made through proper selection of one of several arc welding methods although poor ductility of cast iron has often led welding engineers to approach such jobs with considerable caution. Five types of electrodes may be used.

22-451. **Salt Bath Brazing.** *Steel*, v. 115, Sept. 25, '44, pp. 104, 110.

Reduces rejects, improves finished ordnance parts by selective operation in salt bath furnaces.

22-452. **Spot Welding on the "Lancaster".** *Welding*, v. 12, August '44, pp. 354-362.

Latest methods of aircraft production; spot welding equipment used; electrode tips; cleaning of material; inspection and testing; production methods.

22-453. **Progress in the Spot Welding of Heavy Mild Steel Plates.** H. E. Dixon. *Welding*, v. 12, August '44, pp. 368-374.

The welding of thin mild steel sheet; difficulties encountered in the spot welding of heavy mild steel; survey of early progress in heavy spot welding methods; heavy spot welding methods.

22-454. **Fabrication of Tractor Wheels.** N. B. Cave. *Welding*, v. 12, August '44, pp. 375-376.

Utilization of arc and flash butt welding.

22-455. **Welding of Aluminum Bronzes.** *Welding*, v. 12, August '44, p. 377.

Application of "Bronalex" electrodes.

22-456. **Fabrication Methods.** J. A. Dorrat. *Welding*, v. 12, August '44, pp. 384-396.

Manipulators and automatic welding.

22-457. **Design and Methods of Construction of Welded Steel Merchant Vessels.** *Welding Journal*, v. 23, Sept. '44, pp. 794-807.

Investigation of the possible defects which have led to the fracture of ship structures afloat.

22-458. **Welding Aluminum and Its Alloys.** *Welding Journal*, v. 23, Sept. '44, pp. 808-811.

Welding properties of aluminum; joint design for aluminum welds; preparation for welding; use of flux; cleaning and finishing; control of the puddle; welding sheet aluminum; welding aluminum plate; heavy plates and castings.

22-459. **Proposed Recommended Practices for Resistance Welding.** *Welding Journal*, v. 23, Sept. '44, pp. 812-817.

Recommended practice for the flash-butt welding of low and medium strength forging steels.

22-460. **The Surface Treatment at Room Temperature of Aluminum Alloys for Spot Welding.** W. F. Hess, R. A. Wyant and B. L. Averbach. *Welding Journal*, v. 23, Sept. '44, pp. 417-s-435-s.

The discovery and development of a new solution for the surface preparation of Alclad 24S-T. This solution

(No. 14) is very satisfactory from all points of view, and possesses the highly desirable advantage of operating at room temperature. 3 ref.

22-461. **The Spot Welding of 0.0375-in. Aluminized Low-Carbon Steel.** H. W. Brown. *Welding Journal,* v. 23, Sept. '44, pp. 458-s-473-s.

Calibration of pressure gage; physical properties and general characteristics of aluminized steel; effect of tip shape; effect of surface cleaning of material; effect of specimen width; characteristics of welds in 0.0375 aluminized steel; dispersion; corrosion. 29 ref.

22-462. **Fabrication and Welding of Large Transformer Tanks.** H. W. Allison. *Steel Processing,* v. 30, Sept. '44, pp. 565-567.

Permanent oil tightness and a mechanical strength capable of supporting from 6 to 8 times its own weight are the primary requisites of large power-transformer tanks.

22-463. **The Design, Preparation and Use of Silver Brazed Joints.** A. M. Setapen. *Steel Processing,* v. 30, Sept. '44, pp. 568-573.

The use of low temperature silver brazing alloys in the fabrication of materials prepared from pressed metal parts.

22-464. **Surface Preparation for Spot Welding Aluminum.** G. Thornbury. *Iron Age,* v. 154, Sept. 28, '44, pp. 46-49.

A new type of etchant has been developed that removes soil and oxide film without attacking the subsurface metal and produces uniform surface contact resistance so desirable for consistent spot welds.

22-465. **Welding Stainless Steel.** *Aircraft Production,* v. 6, Sept. '44, p. 429.

Influence of flame adjustment and fluxes when gas welding exhaust manifolds.

22-466. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 115, Oct. 2, '44, pp. 98, 100, 103, 114, 116.

Readily applied to pure nickel and high nickel alloys. Techniques involved are much like those for fabricating mild and stainless steels.

22-467. **Roller Mill Maintenance.** Theodore W. Morgan. *Iron & Steel,* v. 17, Sept. '44, pp. 603-606.

Day-to-day maintenance problems and the way in which welding has been employed in dealing with them. It has been found that through an extended use of welding methods costs can be materially cut and the time needed for repairs reduced, in some cases, by months.

22-468. **Electronics Now Permits Balanced 3-Phase Resistance Welding.** G. W. Birdsall. *Steel,* v. 115, Oct. 9, '44, pp. 126-127, 278, 280, 282, 284.

New system puts perfectly balanced load on all three phases of power line, thus greatly extending scope of resistance welding processes, including the joining of ¾-in. plates.

22-469. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel,* v. 115, Oct. 9, '44, pp. 136, 138, 304, 306, 308.

Once the idiosyncrasies of copper materials are understood, competent structures may be built with confidence by welding.

22-470. **Impedance of Welding Cable Laid on a Steel Deck.** F. Brailsford. *Welding,* v. 12, Sept. '44, pp. 398-401.

The impedance of the circuit comprising a welding cable laid on a steel deck with the current returning through the ship's hull is calculated. The calculations are based on a number of simplifying assumptions since a rigid mathematical solution does not appear to be possible. Curves are given for various sizes of cable showing the total impedance and its various constituent components of resistance and reactance.

22-471. **Progress in the Spot Welding of Heavy Mild Steel Plates.** H. E. Dixon. *Welding,* v. 12, Sept. '44, pp. 402-410.

Pulsation welding; conventional a. c. method using high currents and short continuous welding times; "forged-spot" welding; Temp-a-Trol spot welding; production of spot welds of good strength consistency; value and future of heavy spot welding methods. 14 ref.

22-472. **Vertical Boiler Welding Repairs.** J. K. Johannesen. *Welding,* v. 12, Sept. '44, pp. 413-417.

Welding aids swift and efficient maintenance.

22-473. **The Welding Department.** H. Marquand. *Welding,* v. 12, Sept. '44, pp. 418-421.

Advice is given regarding the selection of the various processes available. The best methods of organizing a welding shop are discussed and also the means of securing efficient control over production.

22-474. **Progress in Research.** *Welding,* v. 12, Sept. '44, pp. 422-423.

Weldability of silicon-manganese steels; peening. 5 ref.

22-475. **Recent Developments in the Welding of Light Metals.** W. K. B. Marshall. *Welding,* v. 12, Sept. '44, pp. 432-438.

Gas welding magnesium—best alloy; removal of flux residues; finishing; properties of gas welds.

22-476. **Roll Gun Welders Fabricate Steel Jettison Tanks.** John C. Silliman. *Iron Age,* v. 154, Oct. 12, '44, pp. 67-73.

Difficulties in resistance welding jobs can often be traced to inadequate preliminary production planning and cost analysis, improper tooling or failure to control welding processes. Step-by-step description of the planning required for economical tooling up for resistance welding of gasoline tanks, and a detailed description of the special portable roll welding guns and fixtures.

22-477. **Economies of Welded Fabrication Sure to Attract Postwar Industry.** *American Machinist,* v. 88, Oct. 12, '44, pp. 91-100.

Pressure welding makes strong butt joints; arc welding made war production possible; savings possible through automatic arc welding; versatility characterizes resistance welding; electrodes are water cooled or re-

frigerated; careful inspection insures against faulty welds; designs must be made with welding in view.

22-478. **Patrol Craft Mass-Produced on Welding Assembly Line.** F. M. Gunn, *American Machinist,* v. 88, Oct. 12, '44; pp. 119-123.

Complete hull and deck sections are fabricated indoors in jigs. The finished sections are then shipped to yards for final assembly.

22-479. **Aluminum Electrodes.** Harold Lawrence. *Steel,* v. 115, Oct. 16, '44, pp. 108, 110, 150, 152.

Coated arc welding electrodes now prevent interference of aluminum oxide in production of slag-free welds in aluminum. Both wrought and cast aluminum parts readily fabricated by arc welding, except 24S alloy which loses high physical properties at and around the weld. This concludes series on arc welding electrodes.

22-480. **Welding Cheats Davy Jones.** T. B. Jefferson. *Welding Engineer,* v. 29, Oct. '44, pp. 44-46.

The job the Puget Sound Navy Yard is doing to keep Uncle Sam's fighting ships in the fight.

22-481. **Spot Welding Armor Plate.** Fred A. Lee. *Welding Engineer,* v. 29, Oct. '44, pp. 47-51.

A major departure from conventional spot welding is a new control which permits preheating, grain refinement tempering, forging to be done on the welding machine.

22-482. **Arc Welding Armor Plate.** Brigadier W. M. Blagden. *Welding Engineer,* v. 29, Oct. '44, pp. 52-55, 74.

Our British allies have experienced a parallel development in tank construction and now employ many of the processes and procedures used for welding armor in the U. S.

22-483. **Saved: Oxygen and Acetylene.** Don Llewellyn. *Welding Engineer,* v. 29, Oct. '44, pp. 56, 58-59.

There are a thousand ways to waste cutting gases in a shipyard, but even a myriad of leaks may be plugged by intelligent, persistent effort. How Calship employees coöperated to conserve vital gases.

22-484. **Which Size for First Pass?** Joseph S. Wright. *Welding Engineer,* v. 29, Oct. '44, pp. 60, 62.

Where deep penetration is wanted on a tight butt weld, is it advisable to use a ⅛ or a 3/16-in. electrode on the first pass?

22-485. **Operation of Single-Phase Welder From Three-Phase Supply.** *Engineering,* v. 158, Sept. 15, '44, p. 206.

The main object of reducing the welding load on the supply cable, and thus enabling it to carry new additional load, satisfactorily accomplished; it is understood that a further 150-kva. to 200-kva. can now be carried by the same cable.

22-486. **Helium-Shielded Arc Welding of Stainless Steel Exhaust Collectors.** Francis H. Stevenson. *Welding Journal,* v. 23, Oct. '44, pp. 873-876.

The 18-8 type of stainless steel is used almost exclusively in the manufacture of exhaust collectors. Two

of the points which cause the welder and user of this steel difficulty are carbide precipitation and distortion.

22-487. **Arc Welding Practice in the Steel Foundry.** Frank Kiper and Lawrence Gabes. *Welding Journal,* v. 23, Oct. '44, pp. 877-881.

"Know welding" men at the Ohio Steel Foundry Co. have set up easy to follow practices which fulfill all specification requirements as well as good practice principles.

22-488. **Small Portable Condenser Welding Set.** E. M. Callender. *Welding Journal,* v. 23, Oct. '44, pp. 882-890.

The portable discharge welder is one of four units comprising a complete field repair outfit. This welder is light, mobile, and employs an unusually small welding transformer. It is designed to operate in conjunction with a portable hand air gun, and with long secondary welding cables that produce a much higher impedance secondary circuit than is normally permissible in most discharge welding machines.

22-489. **Evolution of Welding in Shipbuilding.** M. N. Maltseff. *Welding Journal,* v. 23, Oct. '44, pp. 906-911.

Some of the main points in the evolution of ship construction, from a welding standpoint.

22-490. **Low-Reactance Cables for Portable Resistance Welders.** Myron Zucker. *Welding Journal,* v. 23, Oct. '44, pp. 911-915.

Mechanical and economic values of the interleaved welding cable grew out of the development of a design to improve the electrical effectiveness of gun welding equipment.

22-491. **Standard Details for Welded Building Construction.** H. W. Lawson. *Welding Journal,* v. 23, Oct. '44, pp. 916-933.

There is now an adequate basis in research, particularly in that conducted over the last 15 years at Lehigh University, to justify an agreement on the principles of design for beams and their welded connections. A set of welded details which with their capacities, are ready for handbook publication and general professional acceptance. 15 ref.

22-492. **Fundamentals of Heavy Cutting.** G. L. Walker and H. G. Hughey. *Welding Journal,* v. 23, Oct. '44, pp. 934-942.

A study of the problem of cutting heavy sections, intended to bring out information of importance in the design of equipment and in the conditions of use.

22-493. **Characteristics of Welding Arcs on Aluminum in Atmospheres of Helium and Argon.** F. A. Wassell. *Welding Journal,* v. 23, Oct. '44, pp. 487-s-493-s.

An investigation, based on the principle of gas-shielded arc welding, utilizing inert gases such as helium and argon, for the purpose of developing a process which would eliminate the use of flux in the welding of aluminum. Some unusual and interesting phenomena observed during this investigation.

22-494. **The Geometry of the Spot-Welding Tip and Its Relation to Tip Life.** Earl D. Crawford and C. Weston

Steward. *Welding Journal,* v. 23, Oct. '44, pp. 494-s-498-s.

A microscopic examination of the tips after a successful run showed a definite, raised, flat-ended button on what had originally been a 3-in. radius dome.

22-495. **The Effect of Metallurgical Changes Due to Heat Treatment Upon the Fatigue Strength of Carbon Steel Plates.** Walter H. Bruckner and Wm. H. Munse. *Welding Journal,* v. 23, Oct. '44, pp. 499-s-510-s.

Tests to determine the effect of metallurgical changes associated with welding, without actually depositing a weld, upon the fatigue strength of carbon steel specimens.

22-496. **Some Observations on the Welding of Manganese Steels.** W. B. Brooks and A. G. Waggoner. *Welding Journal,* v. 23, Oct. '44, pp. 511-s-523-s.

Theory of hardenability as applied to welding. The hardenability of manganese steels studied by means of the L-Jominy test. Weldability studied by means of slow notch bend test and microhardness surveys. Actual hardenability of low-carbon manganese steels substantially less than the calculated value. The L-Jominy test does not predict relative weldability as judged by maximum hardness and slow notch bend angles. The effect of varying base metal temperatures from 30 to 150° F. Based on examination of the hardenability and strengthening effects of various elements, a high-tensile steel having a low weld hardenability is designed and tested. 23 ref.

22-497. **The Bead-Weld Nick-Bend Test for Weldability.** Clarence E. Jackson and George G. Luther. *Welding Journal,* v. 23, Oct. '44, pp. 523-s-535-s.

A review of the various direct and indirect methods for determining weldability. 13 ref.

22-498. **The Effect of Postheat in Welding Medium Alloy Steels.** Myron A. Pugacz, Geoffrey J. Siegel and Jay O. Mack. *Welding Journal,* v. 23, Oct. '44, pp. 536-s-544-s.

The conclusions drawn from this study suggest the possibility of advancing aircraft design by making use of lighter sections to obtain required physical properties and increasing the reliability of present design values. The importance of controlling the postheat time and temperature in other applications such as the welding and the flame cutting of engineering steels and other medium alloys of any gage is also indicated.

22-499. **Salt Baths for Copper Brazing.** Charles R. St. John. *Metal Progress,* v. 46, Oct. '44, p. 715.

This salt quench checks the flow of copper immediately, eliminating any tendency to run or blow or form a blob on the surface of the work.

22-500. **Wing Routing the "Skytrain" & "Dauntless."** Gordon B. Ashmead. *Modern Industrial Press,* v. 6, Oct. '44, pp. 35-36, 44.

Joining problems of rather cumbersome assemblies.

22-501. **Electronic Controls for Resistance Welding.** Holbrook L. Horton. *Machinery,* v. 51, Oct. '44, pp. 153-159.

Method of controlling heat generated at the weld; non-synchronous and synchronous timing control; ele-

ments of the spot-weld cycle; semi-automatic weld timers; automatic weld timers; sequence timers; resistance welding before the war; electronic controls for the storage type of welders; electronic controls with special functions.

22-502. **Unique Jig Devised for Canteen Welding.** W. F. Lautner. *Machinery,* v. 51, Oct. '44, pp. 162-163.

Oxy-acetylene welded aluminum canteens turned out on jigs, of a unique design devised by the company.

22-503. **So—You Want to Own Your Own Job Shop.** E. S. Wheeler. *Industry and Welding,* v. 17, Oct. '44, pp. 42-43, 114-115.

Pitfalls and suggestions on how to avoid them, for the man contemplating opening his own shop.

22-504. **Maintenance Welding at American Airlines** F. R. Cassel. *Industry and Welding,* v. 17, Oct. '44, pp. 54-56.

Maintenance and fabricating welding plays a leading role in keeping hard-to-get equipment in the air.

22-505. **Blazing the Trail with Welded Construction.** G. S. Storatz. *Industry and Welding,* v. 17, Oct. '44, pp. 74-78.

General problems and approach.

22-506. **A New Fabrication Method—Multiarc Welding.** Malcolm C. Rivenburgh and C. Weston Steward. *Steel,* v. 115, Oct. 23, '44, pp. 68-71, 96.

Twin carbon torch produces five arcs simultaneously to deliver concentrated heat under perfect control.

22-507. **The Jointing of Metal.** J. Aherne-Heron and L. N. Smith. *Aircraft Engineering,* v. 16, no. 180, Feb. '44, p. 59-60. *Engineers' Digest,* v. 1, Sept. '44, pp. 581-582.

Inefficiency of present methods and possibilities for development of new forms of jointing.

22-508. **Recent German Developments in Electric Welding.** M. W. Bourdon. *Automotive Industries,* v. 91, Oct. 1, '44, pp. 35-37, 98.

The Weibel method for welding light-alloy sheets and the development of miniature arc-welding equipment for joining wires.

22-509. **Some Brazing Tips.** Lawrence D. Jennings. *Machine Tool Blue Book,* v. 40, Oct. '44, pp. 173-174, 178, 180, 182, 184, 186, 188, 190.

Economy, strength, ductility, conductivity, corrosion, types of joints, brazing alloys, cleaning, fluxing, heating, dip brazing, resistance brazing, furnace brazing, removal of flux.

22-510. **Effect of Time of Storage on Ductility of Welded Test Specimens.** Clarence E. Jackson and George G. Luther. American Institute of Mining & Metallurgical Engineers Technical Publication no. 1772, 8 pp.

Development of nick-bend test designed for studying the effect of welding on the ductility of a steel. 3 ref.

22-511. **Brazing Pump Assemblies.** G. Eldridge Stedman. *Steel,* v. 115, Oct. 30, '44, pp. 96, 98, 101, 127.

Because of its principle of "squeezing" water, new Peerless pump raises water efficiently from almost any depth. First juncture in production of double case for the submersible pump is silver brazing the overlapping ends of the outer case.

22-512. **Researches in Alloy Steel Welding.** D. Hanson, A. H. Cottrell, K. Winterton, J. A. Wheeler, and P. D. Crowther. Institute of Welding *Transactions*, v. 7, July '44, pp. 43-44.

Structure and properties of austenitic steel single-run and multi-run welds. Temperature and mode of initiation of hardened zone cracking. Quantitative measurement of the transverse stress across butt-welded joints, and its formation and development during and after welding. Analysis made of the effect of "local stresses," formed in the hardened zone. Result discussed from a theoretical point of view in order to establish a theory of cracking. 4 ref.

22-513. **A Note on the Initiation of Hardened Zone Cracks.** A. H. Cottrell. Institute of Welding *Transactions*, v. 7, July '44, pp. 54-56.

Method involving the release of restraint at a definite temperature; study of cracking phenomena by means of magnetic flux changes.

22-514. **A Quantitative Study of the Stress Cycle Across Butt-Welds.** K. Winterton and J. A. Wheeler. Institute of Welding *Transactions*, v. 7, July '44, pp. 56-68.

Rectangular frame designed, within which two welding plates can be rigidly restrained. The transverse stress set up when these plates are welded together has been continuously measured during and after welding, by means of a mechanical extensometer (with optical lever) mounted on one of the plates perpendicular to the direction of welding. 11 ref.

22-515. **A Note on the Effect of Local Stresses on Mechanical Properties.** A. H. Cottrell. Institute of Welding *Transactions*, v. 7, July '44, pp. 69-71.

Observed breaking stress and ductility may, under suitable circumstances, be reduced by the presence of local stresses. The reduction in the breaking stress is more profound, the greater is the intensity of the local stresses and the less is the ductility. Effect of ductility upon the breaking stress, for a given local stress, is most important; if the ductility of the material is greater than about 1%, the breaking strength value is fairly insensitive to the presence of local stresses.

22-516. **The Problem of Hardened Zone Cracking.** D. Hanson, A. H. Cottrell, K. Winterton, and J. A. Wheeler. Institute of Welding *Transactions*, v. 7, July '44, pp. 71-74.

Hardened zone failure occurs under the combined influence of local stresses. Mutual reinforcement by stresses of these two types is only possible in materials having extremely low ductilities; such a condition is produced in the hardened zone by its overheating during welding. Explanation is provided of the alleviation of base-plate cracking by pre-heating, delayed cooling, lining, reduction of the plate-metal carbon content and the use of mild steel and austenitic steel electrodes.

22-517. **A Suggested Cause and a General Theory for the Cracking of Alloy Steels on Welding.** G. L. Hopkin. Institute of Welding *Transactions*, v. 7, July '44, pp. 76-78.

Resume of reports issued by the Armament Research Department, Ministry of Supply. A suggested cause for the cracking of alloy steels on welding, by G. L. Hopkin, March '42. The welding of high alloy high tensile steels with ferritic electrodes with controlled hydrogen coating, by G. L. Hopkin and E. L. Evans, August '43. A general theory on the cracking of alloy steels on welding by G. L. Hopkin, Dec. '43. 4 ref.

22-518. **Flame-Cutting in the Shipyard.** G. M. Boyd. Institute of Welding *Transactions*, v. 7, July '44, pp. 79-94.

Process; "crabbing" device; profilers; tracing devices; photoelectric machine; flame planers; supports accuracy; distortion; bevel cutting; "rip and trim cutting"; stack cutting; layout; economics; drag. 22 ref.

22-519. **The Arc Welding of High-Tensile Alloy Steels. II.** E. C. Rollason. *Welder*, v. 13, Jan.-June '44, pp. 6-9.

Shrinkage strains and stresses; effect of three-dimensional tension; design; cracking; cracking tests; prevention of cracks; electrodes; welding technique; preheating; post-heating; sequence of welds; mechanical properties.

22-520. **The Design of Continuous Beams and Frameworks, VII.** H. V. Hill. *Welder*, v. 13, Jan.-June '44, pp. 10-20.

Building frames.

22-521. **Wrought Aluminum Alloys and the Application of Resistance Welding.** *Welding*, v. 12, Oct. '44, pp. 450-455.

Weld inspection, strength properties of welds, and the design of suitable joints.

22-522. **The Arc Welding of High Tensile Steels.** H. F. Tremlett. *Welding*, v. 12, Oct. '44, pp. 440-445.

Metallurgical aspects. A scheme is suggested which should enable the welder to select a procedure that would, in the majority of cases, eliminate the risk of cracked joints.

22-523. **The Welding Department.** H. Marquand. *Welding*, v. 12, Oct. '44, pp. 456-461.

Planning and control.

22-524. **Stud Welding.** E. Leede. *Welding*, v. 12, Oct. '44, pp. 463-466.

A resistance welding application.

22-525. **Recent Developments in the Welding of Light Metals.** W. K. B. Marshall. *Welding*, v. 12, Oct. '44, pp. 472-480.

Corrosion resistance of light alloy welds; improvements in gas welding equipment; arc welding; metallic-arc welding in general applications; carbon arc welding; Heliarc welding. 5 ref.

22-526. **Hard-Facing Materials Applied to Tool Work.** C. E. Phillips. *Tool & Die Journal*, v. 10, Oct. '44, pp. 101-103, 214.

Properties and correct procedures for applying the numerous hard-facing materials.

22-527. **Spot-Welding.** *Aircraft Production,* v. 6, Oct. '44, pp. 474-478.

Equipment used; electrode tips; cleaning of material; inspection and testing; production method applied to Aero Lancaster components.

22-528. **Welding Magnesium Structures.** V. H. Pavlecka and J. K. Northrop. *Aircraft Production,* v. 6, Oct. '44, pp. 501-504.

Details of Heliarc process for joining aircraft parts made of magnesium.

22-529. **Simplifying Light-Alloy Welding.** *Light Metals,* v. 7, Oct. '44, pp. 463-464.

Summary of a new range of proprietary filler rods and electrodes for use in the welding of aluminum-base alloys.

22-530. **Fixtures Speed Welding of Magnesium Wing Tips.** Leslie M. Byars. *American Machinist,* v. 88, Nov 9, '44, pp. 91-93.

Planned tooling aids in the working of sheet magnesium for Northrop's new night fighter.

22-531. **Welded Railroad Rails.** Clyde B. Clason. *Welding Engineer,* v. 29, Nov. '44, pp. 40-43.

The three chief welding methods — oxy-acetylene pressure, flash and thermit. 6 ref.

22-532. **Helium-Shielded Arc Welding.** Francis H. Stevenson. *Welding Engineer,* v. 29, Nov. '44, pp. 44-47.

The use of the inert-gas-shielded welding process for stainless steel exhaust collectors.

22-533. **Progress in Automatic Arc Welding.** R. F. Wyer. *Machinery,* v. 51, Nov. '44, pp. 148-154.

Improved automatic arc-welding machines and equipment are capable of reducing costs, increasing production, and improving quality of product.

22-534. **Low-Temperature Silver Brazing Used in Making Chemical Mortar Shells.** Harry R. Lebkicher. *Machinery,* v. 51, Nov. '44, pp. 155-159.

Uses; operation; advantages.

22-535. **Electric Furnace Brazing Being Widely Extended.** H. M. Webber. *Iron Age,* v. 154, Nov. 16, '44, pp. 48-52.

Stampings brazed to each other or to screw machine parts have replaced other methods of fabrication in the manufacture of ordnance and aircraft components.

22-536. **Welding as an Aid in Shipbuilding Construction.** Howard L. Vickery. *Welding Journal,* v. 23, Nov. '44, pp. 1011-1014.

Success judged from delivery of adequate tonnage when most needed; usefulness of the vessels; ability of the vessels to stand up to wartime service; cost to the taxpayer.

22-537. **Proposed Recommended Practices for Resistance Welding.** *Welding Journal,* v. 23, Nov. '44, pp. 1015-1019.

Standard methods for mechanical testing of resistance welds.

22-538. **Metallic Arc Welding Electrodes, I, II, III.** Harold Lawrence. *Welding Journal,* v. 23, Nov. '44, pp. 1020-1030.

Stainless steel electrodes; hard surfacing electrodes; cast-iron electrodes.

22-539. **The Welding and Heat Treating of Couplers and Other Car Parts.** John McMullen. *Welding Journal,* v. 23, Nov. '44, pp. 1041-1047.

History of change in AAR regulations and the methods used at Erie in reclaiming cracked couplers.

22-540. **Shrinkage Distortion in Welding.** W. Spraragen and M. A. Cordovi. *Welding Journal,* v. 23, Nov. '44, pp. 545-s-559-s.

Butt welds; beads of weld metal; fillet welds; plug welds; spot welds; shrinkage distortion in structural welding; methods of controlling distortion due to welding; measurements of distortion during welding and cooling; flame cutting. 46 ref.

22-541. **A Physical Examination of Welds Made From Austenitic Steel Electrodes.** D. Hanson, A. H. Cottrell, K. Winterton, and P. D. Crowther. *Welding Journal,* v. 23, Nov. '44, pp. 574-s-583-s.

Microscopic studies have been made of single run austenitic welds in an endeavor to explain their resistance to cracking. Butt weld tests on multi-run 18-8 welds gave severe interface cracking, which was overcome by means of lining. These facts were investigated by microscopic examination and mechanical tests. Austenitic steel electrodes are considered to be resistant to base plate cracking because the hardened zone is toughened by arms of retained austenite. Interface cracking is ascribed to high stresses promoted by low ductility of the 18-8 multi-run weld metal, this being due to the effects of carbide precipitation and to triaxial stresses. Cracking was successfully avoided in some ferritic steel multi-run welds by lining the welding V with mild steel weld metal. 9 ref.

22-542. **A Suggested Cause and a General Theory for the Cracking of Alloy Steels on Welding.** G. L. Hopkin. *Welding Journal,* v. 23, Nov. '44, pp. 606-s-608-s.

Resume of various reports issued by the Armament Research Department, Ministry of Supply. 4 ref.

22-543. **Routine Inspection and Salvage of Defective Machinery Weldments.** James W. Owens. *Steel,* v. 115, Nov. 20, '44, pp. 105-106, 108, 150, 152, 154.

Need for sound planning to establish operator training, inter-departmental responsibility and use of proper equipment emphasized. New approaches to metallurgical aspects of salvage welding outlined.

22-544. **Factors in Machine Base Design.** F. C. Kardevan. *Industry and Welding,* v. 17, Nov. '44, pp. 35-36, 88-90.

Only when all factors in welding organization and planning are covered can satisfactory and efficient operation be expected.

22-545. **Studding of Cast Iron.** R. Kraus. *Industry and Welding,* v. 17, Nov. '44, pp. 36-39.

New combination of studding, electric welding and bronze welding.

22-546. **Longer Tip Life for Spot Welding Aluminum.** Earl D. Crawford and C. Weston Steward. *Industry and Welding,* v. 17, Nov. '44, pp. 40-41, 44, 94.

Improvement in spots-per-tip-cleaning made with a specially contoured tip.

22-547. **Hints on Hard-Facing Procedure.** *Industry and Welding,* v. 17, Nov. '44, pp. 46-47.

Basic procedures.

22-548. **So—You Want to Own Your Own Shop. Part II.** E. S. Wheeler. *Industry and Welding,* v. 17, Nov. '44, pp. 48-50, 52.

Equipment and shop layout hints to job shop operators.

22.549. **Electric Furnace Brazing.** Lawrence Jacobsmeyer. *Industry and Welding,* v. 17, Nov. '44, pp. 54-58, 77.

If your product can receive the special designing necessary to use this process advantageously electric furnace copper brazing will show astounding profit possibilities.

22-550. **Blazing the Trail with Welded Construction. Part II.** G. S. Storatz. *Industry and Welding,* v. 17, Nov. '44, pp. 60-62.

Moldboard assembly, A-frame assembly.

22-551. **A Makeshift Makes Good.** H. B. Ford. *Industry and Welding,* v. 17, Nov. '44, pp. 64-68.

A product welded in the old cast steel design—and it's lighter, stronger, more economical to make and operate.

22-552. **Electric Furnace Brazing Being Widely Extended.** H. M. Webber. *Iron Age,* v. 154, Nov. 23, '44, pp. 52-56.

Examples of where electric furnace brazing has been able to produce stronger and less costly components for ordnance and aircraft than formerly obtained. A new type of combination brazing and heat treating furnace also described.

22-553. **Fabrication and Reclamation in Steel Mill Maintenance.** E. W. Gruber. *Welding Journal,* v. 23, Nov. '44, pp. 1031-1040.

Description of a welding department in a steel mill. Making the mill almost self-sufficient in providing for all repair, reclamation, replacement and original construction needs.

22-554. **Learning Arc Welding Design by Welding Shop Equipment.** Walter J. Brooking. *Iron Age,* v. 154, Nov. 30, '44, pp. 58-64.

Beginning designer can gradually accumulate enough experience to apply arc welding to the plant product on a mass production basis. Acquires a sense of proportion and knowledge of fabrication methods necessary to the successful application of the arc welding technique.

22-555. **Pressure Welding.** A. R. Lytle. *Canadian Metals and Metallurgical Industries,* v. 7, Nov. '44, pp. 34-40.

Produces welds with excellent physical properties; pressure and blowpipe equipment; types of joints; control; metal compositions amenable to pressure welding; physical properties; microstructure; economy; application of the process; merits.

22-556. **Aluminum Welding With LP-Gas.** J. V. Kielb. *Western Metals,* v. 2, Nov. '44, pp. 64, 66.

Advantages; thermal content; setting neutral flame.

22-557. **Soldering and Brazing Aluminum.** *Light Metal Age,* v. 2, Nov. '44, p. 23.

Aluminum article dipped into a molten tinning bath and connected to an electrical high frequency magnetostriction device. Particles act under hammer blow impact upon the oxide coat which covers the aluminum. Tin replaces the oxide coat and is bonded to the aluminum by an alloying weld.

22-558. **The Principle, Application and Development of Oxygen Cutting.** R. E. Dore. *Proceedings* of the South Wales Institute of Engineers, v. 60, '44, pp. 72-121. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 157-A.

Development, present position and probable future of oxygen cutting. All aspects are dealt with including automatic profile cutting, the oxygen lance, cutting cast iron, flame deseaming, underwater cutting, and cutting with oxygen in conjunction with acetylene, propane and coal gas.

22-559. **Industrial Application of Automatic Submerged Arc Welding.** R. R. Sillifant. *Proceedings* of the South Wales Institute of Engineers, v. 60, '44, pp. 40-56. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 157-A.

Unionmelt welding process and its application for welding boilers and pressure vessels given.

22-560. **The Testing of Welds in the Laboratory and the Workshop.** J. Davidson. New Zealand Institute of Welding: *Australasian Engineer Science Sheet,* June 7, '44, pp. 26-29. Abstract, Iron and Steel Institute *Bulletin,* no. 106, Oct. '44, p. 157-A.

Welders should not only be skillful in the manipulation of their tools and the materials they are welding, but should also be conversant with the tests to which welds are subjected. Brief descriptions of the principal methods of testing given.

22-561. **Induction Brazing of Bomb Burster Units.** Harry R. Lebkicher. *Metals and Alloys,* v. 20, Nov. '44, pp. 1304-1310.

Pictorial article presents the operating steps in the silver-alloy-brazing of one of the many chemical warfare service products now being fabricated.

22-562. **Spot Welding Magnesium Alloys.** *Light Metals,* v. 7, Nov. '44, pp. 552-560.

Recent American work detailing the technique and limitations of the spot welding process as applied to the ultra-light alloys and types and characteristics of spot welding. Mechanical properties and compositions of typical alloys.

22-563. **Tool Steel Welding.** E. L. Foote. *Iron Age,* v. 154, Dec. 7, '44, pp. 70-74.

Data show how closely the characteristics of the weld deposit conform to those of all basic types of tool steel.

22-564. **Process Control for Spotwelding Aluminum.** *American Machinist,* v. 88, Dec. 7, '44, pp. 117, 119.

The cleaning of aluminum alloys prior to spot-welding.

22-565. **Pressed Assemblies for Brazing.** A. K. Phillippi. *Metal Progress,* v. 46, Dec. '44, p. 1275.

The strongest joints result from assemblies of 0.002-in. press fit. Disadvantage of tighter fits is that it takes a longer furnacing time, to permit the copper to penetrate.

22-566. **British Practice in Gas Welding of Wrought Aluminum Alloys.** E. R. Yarham. *Modern Machine Shop,* v. 17, Dec. '44, pp. 178-180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 205-206, 208, 210.

Welding flame data on the available gases.

22-567. **Silver Alloy Brazing.** Harry R. Lebkicher. *Steel,* v. 115, Dec. 11, '44, pp. 120-122, 124.

Paramount factors governing production of products for Chemical Warfare Service are perfection of output and speed of manufacture. Many items made of thin metals and joined by special silver brazing techniques pass severe service tests.

22-568. **Progress in Automatic Arc Welding.** R. F. Wyer. *Machinery,* v. 51, Dec. '44, pp. 189-191.

Improved automatic arc-welding machines and equipment are capable of reducing costs, increasing production, and improving quality of product.

22-569. **Heavy Spotwelding.** F. Albrecht. *Steel,* v. 115, Dec. 11, '44, pp. 136, 139.

Large and versatile resistance welding machine combines several sources of power with differential pressure control to handle wide range of welding work efficiently. Breaks several important bottlenecks in aircraft plant due to exceptional performance on difficult spotwelding jobs.

22-570. **Solderless Terminals.** F. H. Wells and J. C. Balsbaugh. *Electrical Engineering Transactions,* v. 63, Dec. '44, pp. 933-938.

Description; soldered terminals; test procedures and measurements; test results; resistance measurements on individual strands of a stranded wire with a solderless terminal; effect of different contact metals with copper; effect of temperature during the corrosion cycle.

22-571. **Production Applications of Flash Welding.** Robert Milmoe. *Welding,* v. 12, Nov. '44, pp. 484-492.

Practical applications of flash welding with special reference to the aircraft industry; procedures of tooling requirements, machine settings and general production practice.

22-572. **The Arc Welding of High Tensile Steels.** H. F. Tremlett. *Welding,* v. 12, Nov. '44, pp. 493-500.

Putting before the welder essential metallurgical aspects of the welding of high tensile steels. A scheme

suggested which should enable the welder to select a procedure that would, in the majority of cases, eliminate the risk of cracked joints. 5 ref.

22-573. **Welding on the Normandy Beaches.** J. M. Whitworth. *Welding,* v. 12, Nov. '44, pp. 501-503.

Welding carried out on the Normandy beaches, which helped to make the British landing a success.

22-574. **The Welding Department.** H. Marquand. *Welding,* v. 12, Nov. '44, pp. 504-508.

Best methods of organizing a welding shop and means of securing efficient control over production.

22-575. **Production-Line Brazing.** J. V. Kielb. *Welding Engineer,* v. 29, Dec. '44, pp. 35-38.

Gas brazing superior to arc welding for the fabrication of a certain propellerlike assembly used in a nose fuse; operators trained to arc welding were taught the use of torches.

22-576. **Cold-Weather Welding.** J. S. Wright. *Welding Engineer,* v. 29, Dec., '44, p. 39.

Shipyard welding used to stop when the thermometer fell to below 10° F. Now it can go on regardless of the temperature. Improper crystallization; pre-heating not enough.

22-577. **Welded Railroad Rails.** Clyde B. Clason. *Welding Engineer,* v. 29, Dec. '44, pp. 40-43.

Trend to the all-welded continuous rail is growing; how thermit welding was used to join the rails in Colorado's six-mile Moffat tunnel.

22-578. **Spot-Welded Parts for P-51s.** Gerald Eldridge Stedman. *Welding Engineer,* v. 29, Dec. '44, pp. 44-46.

North American Aviation has brought spot welding to a fine art by a planned progressive layout plus careful consideration of such details as overhead conveyors, plastic fixtures, chemical cleaning methods, standard machine settings, visual and metallurgical inspection.

22-579. **So This Is China.** Fred B. Barton. *Welding Engineer,* v. 29, Dec. '44, pp. 48-49.

Welding is indispensable to the 14th Air Force—the famous "Flying Tigers" of General C. L. Chennault.

22-580. **Notes on Fusion-Welded Boilers.** D. R. Carse. *Railway Age,* v. 117, Dec. 16, '44, pp. 925-926.

War Production Board investigates steel saved in the construction and repair of welded alloy steel locomotive boilers.

22-581. **Repair of Castings.** L. A. Danse. *Welding Journal,* v. 23, Dec. '44, pp. 1119-1123.

Procedures for performing the repair work.

22-582. **Adams Lecture—Solid-Phase Welding.** A. B. Kinzel. *Welding Journal,* v. 23, Dec. '44, pp. 1124-1144.

Complete interface elimination, as determined by the microscope, is the best scientific criterion of the worth of a pressure weld. The mechanism of pressure welding seems to comprise atom transfer across the interface to permit such crystallization. A hypothesis to the effect that the laws of diffusion apply to this atom transport appears both plausible and tenable although the necessary constants for an accurate check of the

hypothesis are lacking. Experiments have shown the important role played by a phase change in effecting trans-interface bonding. This phenomenon as well as a similar effect provided by recrystallization may be thought of as increasing atom transport by virtue of an effectively increased diffusion constant.

22-583. **Oxy-acetylene Pressure Welding.** A. R. Lytle. *Welding Journal,* v. 23, Dec. '44, pp. 1145-1156.

Technical and mechanical aspects of oxy-acetylene pressure welding. The specimens are butted under nominal pressure, heated by means of multiple small oxy-acetylene flames to a temperature of about 1200° C. and upset to a controlled degree. Advantages of process. 2 ref.

22-584. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Welding Journal,* v. 23, Dec. '44, pp. 1159-1168.

Nickel and nickel alloys; copper and copper alloys; aluminum electrodes.

22-585. **Welding Repair Jobs.** James Cable. *Welding Journal,* v. 23, Dec. '44, pp. 1169-1171.

Building up the bronze liners on tail shafts in way of the stern gland packing of several large vessels with electric arc welding.

22-586. **The Measurement of Energy Absorption in the Tee-Bend Test.** Leon C. Bibber and Julius Heuschkel. *Welding Journal,* v. 23, Dec. '44, pp. 609-S-631-S.

Apparatus and procedure, Navy; deformation energy in making the tee bend; appraisal of the measurement of energy absorption in bending welded specimens.

22-587. **Impact Strength of Arc-Welded Joints in Aircraft Steel.** H. O. Klinke. *Welding Journal,* v. 23, Dec. '44, pp. 633-S-634-S.

Alloy electrodes No. 1 and 2 have better weldability characteristics as compared to the E 6013 electrode, particularly as regards susceptibility to cracking; it may be desirable to use these electrodes for weldments subject to considerable restraint and rigidity.

22-588. **Discussion of Fatigue Studies of Weld Test Triangular Structures with N E 8630 Steel Tubing.** B. A. Kornhauser. *Welding Journal,* v. 23, Dec. '44, p. 635-S.

Value of post-treating the heat-affected weld zones of material specified to be normalized either locally or by heat treating the entire part. 6 ref.

22-589. **Buckling Prevented in Welded Aluminum Sheet.** *Iron Age,* v. 154, Dec. 21, '44, pp. 44-45.

On large work, controlled expansion in special jigs which hold the work flexible is being used in place of preheating, still retained on small work.

22-590. **Factors Controlling the Weldability of Steel.** L. Reeve. *Welding,* v. 12, Nov. '44, pp. 521-530.

Metallurgical factors; development of our understanding of the factors controlling the weldability of high tensile steels.

SECTION XXIII

INDUSTRIAL USES AND APPLICATIONS

23-1. **Metals in Post-War America.** Ernest E. Thum. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 73-77, 126.
Future of iron, stainless steel, copper, nickel, aluminum, beryllium, lead, tin, and zinc.

23-2. **Steel Aircraft Tubing of NE8630 Steel.** A. J. Williamson. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 115-118.
NE8630 tubing compared with 4130. Properties and test results given.

23-3. **Production, Utility and Acceptance of the NE Steels.** *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 109-114.
Series of brief articles by E. E. Thum, Charles M. Parker, John H. Frye, J. B. Johnson. NE Steels, their formulation and acceptance by the Armed Services.

23-4. **Future Trends in High Alloy Steels.** S. M. Norwood. *Metal Progress,* v. 45, no. 1, Jan. '44, pp. 86-87.
Compositions, corrosion resistant alloys, uses.

23-5. **Phosphorescent Templates.** *Business Week,* no. 751, Jan. 22, '44, p. 68.
New phosphorescent lacquers and photographic emulsions simplify production of templates of highest accuracy.

23-6. **S.A.E. Forecast.** *Business Week,* no. 751, Jan. 22, '44, pp. 64, 66.
Automotive engineers fail to agree on extent of post-war use of light metals, but comparative costs are likely to govern. Account of recent meeting of Society of Automotive Engineers.

23-7. **Piston Metallurgy.** *Aircraft Production,* v. 5, no. 62, Dec. '43, pp. 572-574.
Metallurgical data obtained by investigation of light alloy pistons from German aircraft; types of alloys in use, quality, methods of manufacture employed, and mechanical properties.

23-8. **Hollow Steel Airscrew-Blade Production.** H. W. Perry. *Aircraft Engineering,* v. 15, no. 177, Nov. '43, pp. 331-333.
High strength alloy steel for airscrew blades. Production methods.

23-9. **Designing Bearings for Fluid Film Lubrication.** Arthur H. Korn. *Machine Design,* v. 16, no. 1, Jan. '44, pp. 134-136.

Available information and test results from two authoritative sources in the form of a practical chart on load-carrying characteristics of sleeve bearings.

23-10. **Aluminum—The Precious Metal.** R. H. Ramsey. *Crown,* v. 22, no. 1, Jan. '44, pp. 9-11, 28.

General picture of the possibilities of Al in post-war world.

23-11. **The Production of Slab Tools for Form Twining.** *Machinery* (London), v. 63, no. 1621, Nov. 4, '43, pp. 508-510.

Operations used in the production of slab tools for form twining used at Precision Grinding, Ltd., with description of some of the inspection methods.

23-12. **Grasshopper Wheels.** Byron H. Shinn. *Die Casting,* v. 2, no. 1, Jan. '44, pp. 25-27.

Meeting a 5-ton radial load test and over 1½ ton side load test die cast wheels have had a satisfactory service record since 1936.

23-13. **Safe Cans.** *Die Casting,* v. 2, no. 1, Jan. '44, pp. 25-26.

Substitution of zinc alloy die castings for brass sand castings results in saving of 25% in manufacture of cans for handling volatile liquids.

23-14. **Meehanite Tool Castings.** *Tool and Die Journal,* v. 10, Dec. '44, pp. 100-101, 126.

Use of Meehanite cast metal as the base for carbide tipped cutting tools. History of this application.

23-15. **Superchargers for Aircraft Engines.** R. G. Standerwick and W. J. King. American Society of Mechanical Engineers, *Transactions,* v. 66, no. 1, Jan. '44, pp. 61-73.

Comprehensive treatment covering the development of turbo-superchargers which make possible the outstanding performance at high altitudes of U. S. military aircraft, 29 ref.

23-16. **Metals of the Future.** C. H. Mathewson. *Mining and Metallurgy,* v. 25, no. 445, Jan. '44, pp. 5-11.

Possible future utilization of the unfamiliar metals.

23-17. **Woven Wire Conveyor Belts for Industrial Applications. I. Metals and Alloys Used in Construction.** S. Craig Alexander. *Industrial Heating,* v. 11, no. 1, Jan. '44, pp. 38, 40, 42, 44, 50.

Needs have been met by improving quality, developing special alloys, improving heat treatment methods. Corrosion, mechanical properties, fatigue, corrosion fatigue, high and low temperature effects are studied.

23-18. **Solves Fabricating Problems in Compressor Manufacture.** Stephen J. Benn. *Industry & Welding,* v. 17, no. 1, Jan. '44, pp. 50, 52.

Compressors made cheaper and faster by electric arc welding fabrication.

23-19. **Operating Temperatures and Stresses of Aluminum Aircraft-Engine Parts.** E. J. Willis and R. G. Ander-

son. *S.A.E. Journal, Transactions,* v. 52, no. 1, Jan. '44, pp. 28-36.

To establish the operating temperatures of aluminum cylinder heads and pistons, the authors have developed a method that takes advantage of the fact that the Brinell hardness of the cylinder head and piston decreases with the number of hours of service and the temperature at which the part operates.

23-20. **Hints as to Automotive Future Gleaned from SAE Meeting.** Guy Hubbard. *Steel,* v. 114, no. 5, Jan. 31, '44, pp. 68-69.

Lessons learned in school of war to have profound effect on design and production of machines which will travel on land, in the water and through the air, even though transition from the old to the new will take much longer than the public is being led to believe.

23-21. **A Swedish Aero Engine of 2500 H.P.** *Engineers' Digest,* v. 1, no. 2, Jan. '44, pp. 83-84.

Description of the 2500-h.p. 42-cylinder radial unit engine designed by Mannerstedt.

23-22. **Light Metals and the Motorcycle.** Joe Craig. *Light Metals,* v. 7, no. 72, Jan. '44, pp. 20-30.

How lightness was "added" to a successful racing motorcycle by the judicious use of aluminum and magnesium alloys.

23-23. **Aluminum in Automobiles.** Laurence Pomeroy. *Light Metals,* v. 7, no. 72, Jan. '44, pp. 3-10.

A consideration of factors assuring the achievement of the practical light-metal car.

23-24. **Wrought Aluminum Alloys in Post-War Building.** E. G. West. *Light Metals,* v. 7, no. 72, Jan. '44, pp. 11-19.

Before the war the aluminum alloy industry was quickly expanding its markets in all industrial spheres on purely competitive and economic lines. This movement was checked by the demands of war which dictated that every ounce of aluminum should go to the manufacture of such high priority armaments as aeroplanes and aeroplane parts. The present one-way development of the alloys which stopped the natural evolutionary applications and demanded this abnormal production will cease to provide more than a comparatively small outlet when hostilities cease.

23-25. **Gettering and Getters.** *Light Metals,* v. 7, no. 72, Jan. '44, pp. 34-52.

A comprehensive account of the theory and practice of the use of aluminum and magnesium and special alloys of these metals in the cleaning-up of high vacuo.

23-26. **Rivet Wire and Rivets of Al-Cu-Mg Alloy.** Sven Tobert. *Engineers' Digest,* v. 1, no. 2, Jan. '44, pp. 96-97.

Rivets used in aircraft construction are usually of Al-Cu-Mg alloy with approximately 4% Cu, 0.6% Mg, 0.5% Mn, 0.3% Si, and 0.3-0.4% Fe. Commonly, rivets are driven cold, a few hours subsequent to a solution heat treatment at about 500° C. followed by rapid cooling. As the rivets are subject to rapid age-hardening at ordinary room temperatures, they must be driven within a short time after treatment in order to avoid

the formation of cracks. Keeping the treated rivets on ice makes it possible to retain them in soft state for a somewhat longer time; but, in the author's opinion, this method cannot be considered practical; nor does the comparatively small gain in time justify its use. In actual shop practice, therefore, solution heat treatment is carried out in batches commensurate with the expected rate of demand.

23-27. **Tool Steel Identification System.** *Iron Age*, v. 153, no. 2, Jan. 13, '44, pp. 67, 139.

Classifying and identifying domestic high speed steel cutting tools as agreed on by the three major automobile companies in Detroit.

23-28. **Unit Skid Packaging Proves Efficient Handling Method in Producing Aircraft Engines.** George E. Stringfellow. *Steel*, v. 114, no. 6, Feb. 7, '44, pp. 130-134, 169.

Standard container for oil pumps. Mounted on plywood platforms, finished cylinder heads are carried from final inspection to stock in skid loads of 48 each. Crankcase cabinet serves as a handling unit from assembly to final inspection and for interplant shipments. Some carriers for handling small parts, adapted to varied sizes and shapes with wooden inserts. These are transported on skid platforms.

23-29. **Steel-Backed Mesh Sheet for Light-Rigid Structures.** *Product Engineering*, v. 15, no. 2, Feb. '44, pp. 73-75.

Mesh sheet is satisfactory for airplane side sections and is under investigation for other applications requiring strong, stiff constructions. Fabrication of airplane panels is described and other possible uses of reinforced low-carbon steel in truck bodies, lockers, cabinets and furniture are reviewed.

23-30. **Stampings Joined by Brazing Make Low-Cost Sturdy Parts.** *Product Engineering*, v. 15, no. 2, Feb. '44, pp. 76-79.

Several outstanding illustrations of stamped and brazed sheet-steel parts for both war and peacetime show the possibilities of combining these fabricating methods for producing sturdy, lightweight and economical designs.

23-31. **Conveyors Help Build Bombsights on Schedule.** *American Machinist*, v. 88, no. 3, Feb. 3, '44, pp. 105-114.

Efficacy of conveyors to speed mass production of bombsights along the main assembly line. Operators remove inspected subassemblies from the conveyor behind the bench, locate and dowel them to the die-cast frame of the T-1 computor, according to a picture routing placed at each station. Assembly is speeded by surface-plate bench tops.

23-32. **The Construction of Airplane Landing Mats.** Gordon Robertson. *Modern Machine Shop*, v. 16, Feb. '44, pp. 124-134.

The engineering that preceded the actual fabrication and finishing of portable airfield landing mats played a major role in securing high volume and high quality output.

23-33. **Chemical Research for the Airplane Industry.** O. H. York. *Chemical & Engineering News,* v. 22, Jan. 25, '44, pp. 86-88.

Problems in airplane manufacture which can be solved only by chemical research. Requirements of materials for aircraft construction are more exacting than for any other structure or machine. In airplanes more than in any other application there is absolute necessity for maximum strength combined with minimum weight.

23-34. **Naval Gun Mounts From a Pacific Coast Shop.** Charles O. Herb. *Machinery,* v. 50, Feb. '44, pp. 131-140.

Detailed description of the construction of gun mounts for rapid-fire 5-in. anti-aircraft guns.

23-35. **Production of High-Explosive Shells.** *Machinery (London),* v. 64, Jan. 13, '44, pp. 35-39.

Heat treatment, forging, and other operations required to produce finished shell bodies.

23-36. **Manufacture of Sub-Assemblies for Wheeled Tanks.** *Machinery (London),* v. 64, Jan. 13, '44, pp. 29-31.

Description of the manufacture of sub-assemblies employed by Guy Motors, Ltd.

23-37. **The Rawson Centrifugal Clutch Coupling.** J. A. Holbrook, *Wire & Wire Products,* v. 19, no. 2, Feb. '44, pp. 120, 138.

Three couplings manufactured, sold and serviced by the Syncro Machine Co., Rahway, N. J.

23-38. **Manufacturing Tails for Bombs.** *Machinery,* v. 50, Feb. '44, pp. 180-184.

Description of manufacturing methods of bomb tails employed by a company in England.

23-39. **Production Short-Cuts in Airplane Manufacture.** Ralph H. Ruud. *Machinery,* v. 50, Feb. '44, pp. 141-146.

Unusual methods developed to meet production problems in aircraft building.

23-40. **Fabrication of the T-1 Bombsight.** Franklin M. Reck. *Aero Digest,* v. 44, Feb. 1, '44, pp. 118-120.

Ability of T-1 bombsight, currently in production at Flint, Mich., to adjust itself automatically to changes in altitude, speed, pitch, and role. Refinements introduced by the American manufacturer of the device.

23-41. **Goodyear's Precision Assembly Jigs.** D. P. Reynolds and C. R. Youmans. *Aero Digest,* v. 44, Feb. 1, '44, pp. 110-112.

Heavy jig frames are welded to massive floating base structures independently suspended on leveling jacks, and fittings are attached to the frames at dimensionally predetermined positions by use of surface plates, height gages, etc. Interchangeability is assured.

23-42. **Basic Advantages of All-Plastic Dies and Die-Sets.** David Cook. *Aero Digest,* v. 44, Feb. 1, '44, pp. 106-108.

Rapid development of all-plastic dies in answer to emergency war requirements; how their introduction has relieved critical bottleneck in aircraft production.

23-43. **Fine Die Production in the United States.** Winfield C. Moses. *Wire & Wire Products,* v. 19, no. 2, Feb. '44, pp. 118-119, 142.

Changes in the diamond die industry as a result of the war. Problems still to be solved.

23-44. **A Comparison of Some Properties of Beams in Magnesium and Aluminum Alloys.** *Magnesium Review and Abstracts,* v. 3, Oct. '43, pp. 107-114.

Comparison of some properties of uniform stable cantilever beams in the form of round or square bar, angle or T section, channel, I section or tube in magnesium and aluminum alloys, and presentation of the results in graphical form for quick reference.

23-45. **An Adjustable Square-End Cropping Tool.** Alan Keye. *Machinery (London),* v. 64, Jan. 13, '44, pp. 40-41.

Description of the improved type of cropping tool.

23-46. **Considerations Regarding the Post-War Utilization of Aluminum and Magnesium.** L. W. Kempf. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 5 pp. (mimeo).

Pre-war use of Al in automobiles; marginal price for general use of Al; volume of secondary metal available; sources of Al; fabricating costs; use of Mg.

23-47. **Propellers for Canadian Ships.** *Canadian Metals & Metallurgical Industries,* v. 7, Feb. '44, pp. 18-21.

Highly developed foundry technique at the William Kennedy and Sons, Ltd.

23-48. **Offset Tool Design Conserves Metal and Time.** *Tool & Die Journal,* v. 9, Feb. '44, p. 121.

Method of making offset type Carboloy cemented carbide tools used by Thompson Aircraft Products Co., Euclid, Ohio.

23-49. **Mechanical Problems of Permanent Magnet Design.** Earl M. Underhill. *Electronics,* v. 17, Feb. '44, pp. 126-129, 374-376.

Alnico machining tolerances, casting allowances, choice of alloys, cost factors, methods of mounting and other mechanical problems related to electrical design of permanent magnets are taken up, with emphasis on practical data obtained through actual experience.

23-50. **Reclamation of Automotive Valves.** Norman Hoertz. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 8 pp. (mimeo).

Valve repair requisites for repair and renewal of valve faces and stems: good preparation, welding skill, smooth flowing rod; skilled grinding and machining.

23-51. **Blowing Bubbles.** Tully D. DeStefani. *Die Casting,* v. 2, Feb. '44, pp. 35-36.

Use of tin base alloys in soda fountain equipment. Advantages of die casting process.

23-52. **Conveyors Aid Reconditioning of Tool Sets.** *Iron Age,* v. 153, Feb. 24, '44, p. 71.

Tool control system to increase efficiency in grinding, inspection, storage, maintenance, salvage and disbursement of cutting tools at Grand Rapids Stamping division of Fisher Body Co.

23-53. **Metals and Alloys Used in Construction of Woven Wire Conveyor Belts: II.** S. Craig Alexander. *Industrial Heating,* v. 11, Feb. '44, pp. 198, 200, 202, 204, 206.

Detailed discussion of the composition and properties of the numerous metals, and applications for which they are suited.

23-54. **Shiftable Bevel Gears.** *Die Casting,* v. 2, Feb. '44, pp. 23-24.

Design of die cast gears.

23-55. **Fabrication of Annealing Covers, Pressure Vessels and Galvanizing Kettles at the National Annealing Box Co.** W. N. Robinson. *Steel Processing,* v. 30, Feb. '44, pp. 83-87.

Description of the National Annealing Box Co. plant, Washington, Pa., and details of their construction processes.

23-56. **Production of the M-1 Type of Helmet.** *Steel Processing,* v. 30, Feb. '44, pp. 106-108, 110.

Description of the manufacture of the new American M-1 type helmet being turned out by the McCord Radiator & Mfg. Co., Detroit.

23-57. **Fire Blankets.** Henry Heigis. *Die Casting,* v. 2, Feb. '44, pp. 18-22.

Cylinders for use with CO_2 fire extinguishers are tested at 3000 psi. or more. Die cast parts must meet very high physical standards.

23-58. **NE Steels in the Manufacture of Machine Tool Parts.** George Bissett. *Steel,* v. 114, Feb. 28, '44, pp. 92-93, 128.

Advantages and processing ideas.

23-59. **Light Alloy Pistons From German Aircraft.** C. Wilson. *Metal Treatment,* v. 10, Winter, '43-'44, pp. 255-261.

Summary of various investigations on some light alloy pistons from German aircraft carried out in research laboratories in this country.

23-60. **Cartridge Case Steel.** R. E. L. Stanford. *Iron & Steel Engineer,* v. 21, Feb. '44, pp. 31-37, 41.

Steel cartridge cases came as a result of a brass shortage. Because the steel cases are not as desirable nor as easily made, and because of marked improvement in the brass situation, the production of steel cases has been called off.

23-61. **New Tools from Scrap High Speed Steel.** U. F. T. Norris. *Engineers' Digest,* v. 1, Feb. '44, pp. 149-150.

Description of the re-fabrication of straightforward turning tools.

23-62. **Light Alloys in Ship Construction.** *Engineering,* v. 157, Jan. 21, '44, pp. 52.

History and developments of using light alloys in ship construction.

23-63. **Development of Super-Tension Cables in Great Britain.** F. W. Main. *Engineers' Digest,* v. 1, Feb. '44, pp. 158-160.

Details and design of manufacturing super-tension cables.

23-64. **Piston Rings of Bronze.** Tracy C. Jarrett. *Metals and Alloys*, v. 19, Feb. '44, pp. 351-356.

Melting bronze in high-frequency induction furnaces. Control, analysis, microstructure and uses.

23-65. **The Effect of White-Metalling Crankshaft Journals.** Tom Brown. *Institution of Automobile Engineers Journal*, v. 12, Feb. '44, pp. 24-26.

Preparation, testing and examination.

23-66. **Design and Installation of Pulleys and Pulley Brackets.** Hal. R. Linderfelt. *Aero Digest*, v. 44, Feb. 15, '44, pp. 82-86, 218.

Close alignment vital, alignable bracket, eccentric loads possible, strength and fatigue tests.

23-67. **The Hercules Crankshaft.** J. A. Oates. *Aircraft Production*, v. 6, Feb. '44, pp. 59-66.

Design features: Machining and assembly operations at a shadow factory.

23-68. **Steel-Tube Airscrew Blades.** *Aircraft Production*, v. 6, Feb. '44, pp. 71-75.

Production technique of the American Propeller Corp.

23-69. **A Comparison of Some Properties of Beams in Magnesium and Aluminum Alloys.** *Metallurgia*, v. 29, Jan. '44, pp. 135-137.

Some properties of uniform stable cantilever beams in the form of round or square bar angle or T section, channel, I section or tube in Mg and Al alloys are compared theoretically and in a preliminary way, and the results are presented in graphical form for quick reference.

23-70. **Aluminum in Military Science.** *Light Metals*, v. 7, Feb. '44, pp. 65-71.

Applications of light and ultra-light alloys in spheres specific to military practice and technique. Chemical reactivity, low specific weight and certain promising projectile-resisting qualities of light alloys are among the aspects reviewed.

23-71. **Light Metals and the Art of Music.** *Light Metals*, v. 7, Feb. '44, pp. 95-100.

The physical and acoustic properties of Al alloys (and of certain Mg base alloys) have been put to practical use in the development of a variety of musical instruments, ranging from pianos to bells.

23-72. **Railroad Materials After the War.** C. B. Bryant. *Railway Age*, v. 116, March 4, '44, pp. 461-463.

Products now in use will be improved. Wartime developments will offer new materials and products. All departments are affected.

23-73. **The Hawker Typhoon Single-Seater Fighter and Its Napier-Sabre Engine.** *Metallurgia*, v. 29, Jan. '44, pp. 119-120.

Sabre engines are being produced in increasing numbers for mounting in one of the latest fighter planes, the Typhoon.

22-74. **Interchangeability Aids Production and Salvage of Lancaster Bombers.** *American Machinist*, v. 88, March 2, '44, pp. 105-120.

Lancaster four-motor bomber produced to interchangeability standards established by the British Ministry of Aircraft Production. More than 100 subassemblies produced in Canada are fully interchangeable with similar components produced elsewhere in the Empire. This feature, a definite policy of M.A.P., keeps fighting formations at maximum effectiveness through rapid repair of damaged planes.

23-75. **Barb Wire Collection.** Jewell Ross Davis. *Wire & Wire Products,* v. 19, March '44, pp. 178, 190-191.

Development of barb wire to the important place it occupies in our economy in peace and war.

23-76. **Castings and Forgings Replace Aircraft Weldments.** *Iron Age,* v. 153, March 9, '44, pp. 52-53.

Comparison of cast aluminum and welded steel assemblies.

23-77. **Fabricating Transformer Tanks.** H. W. Allison. *Steel,* v. 114, March 13, '44, pp. 92-93.

Tanks are made from low-carbon steel plate to provide good welding quality. Plate must possess a high degree of flatness, be free from laminations and porosity to prevent leakage of the transformer oil, and withstand bending without fracture. Technique used.

23-78. **The Building of Gliders.** Howard Campbell. *Modern Machine Shop,* v. 16, March, '44, pp. 124-130, 132.

Tools and methods employed by the Gibson Refrigerator Company, Greenville, Michigan, in the building of motorless planes.

23-79. **Piston Crown Temperatures in Compression-Ignition Engine with "Comet" Head.** W. L. Bride. *Institution of Mechanical Engineers,* v. 150, Feb. '44, pp. 134-139.

Tests on a high-speed compression-ignition engine of 120-mm. bore fitted with a Ricardo "Comet" head in which the piston was "Y" alloy. Temperatures were measured by thermocouples in the crown, the connections to the temperature-measuring apparatus being intermittent, and made only when the piston approached bottom dead center. 8 ref.

23-80. **Mass Production of High Explosive Shells.** *Machinery* (London), v. 63, Dec. 30, '43, pp. 729-734.

Methods developed by Willys-Overland in the production of 155-mm. shells adopted as standard practice in the U. S. A. Checking concentricity, machining.

23-81. **The Manufacture of the Sten Gun.** *Machinery* (London), v. 64, Jan. 27, '44, pp. 85-89.

Methods employed in the production of the body case.

23-82. **The Manufacture of the Sten Gun.** *Machinery* (London), v. 64, Feb. 3, '44, pp. 113-117.

Press-tool methods in the production of the body case.

23-83. **The Production of the Magazine for the Sten Gun.** *Machinery* (London), v. 64, Feb. 10, '44, pp. 141-146.

Large outputs from the efforts of small firms.

23-84. **New Method of Setting Shaped Diamond Tools.** P. G. *Machinery* (London), v. 64, Feb. 3, '44, p. 124.

Procedure given for new, practical and economical method in setting diamonds.

23-85. **New Model German and Japanese Planes Show Progress in Design Detail.** *Product Engineering,* v. 15, March '44, pp. 145-150.

Summary of trends in the engineering of enemy aircraft, as exemplified by new models of the Jap "Hamp," the German Focke-Wulf 190 and the Junkers 88. Current practice and developments in engines, controls and materials are emphasized.

23-86. **Universal Control Shafts and Their Development.** *Product Engineering,* v. 15, March '44, pp. 194-196.

Use and limitations of universal shafts for remote control through rotating shafts.

23-87. **Floating Reamers.** *Automobile Engineer,* v. 34, Feb. '44, pp. 69-70.

Two diametrically opposed floating blades and micrometer adjustment, have been incorporated in earlier reamers.

23-88. **Coupling the Army's Portable Pipeline.** Gordon H. Robertson. *Products Finishing,* v. 8, March '44, pp. 30-34.

The Army's "front-line" portable pipe-line which is used in the field.

23-89. **Smooth Rolling.** Chas. Nelson, Jr. *Die Casting,* v. 2, no. 3, March '44, pp. 18-19.

The combination of light weight, resiliency and strength, available in die castings, results in superior performance for another important industry.

23-90. **Duplicating Duplicators.** E. W. Peterson. *Die Casting,* v. 2, no. 3, March '44, pp. 25-27.

In these times particularly, those who design for production have the opportunity to take advantage of the many new technological improvements in materials and processes to do a better job than ever before.

23-91. **How Plastic Tooling Speeds Production.** John Delmonte. *Machine Design,* v. 16, no. 3, March '44, pp. 99-103.

Plastic tools do not possess the strength or mechanical durability of metal tools. Plastic tools can, under proper conditions, be produced at an appreciably lower cost and in much shorter periods of time. Cast plastic tools are successfully adapted to low-stressed form or contour blocks. Flat plates, bolsters and spacer blocks are made from sheet forms of plastics.

23-92. **Selecting Plastic Nameplates.** John W. Greve. *Machine Design,* v. 16, no. 3, March '44, pp. 112-114.

Plastics are replacing critical metals. Molded plates may be produced economically if the quantities are sufficiently large. Materials and procedures.

23-93. **Choosing the Right Material.** H. W. Gillett. *Machine Design,* v. 16, no. 3, March '44, pp. 115-119, 174-178.

The properties required of bearing materials in the light of recent developments and from the viewpoint of conserving strategic materials. Importance of proper testing and interpretation of results is stressed. Gen-

eral principles of special simulated-service testing of other materials are also covered.

23-94. **Pressed Aircraft Pistons.** *Aircraft Production,* v. 6, Feb. '44, pp. 85-92.

Description of the pressing technique and equipment adopted by Specialloid Ltd.

23-95. **Standardization of Aircraft Tubing Proposed.** John W. Offutt and David T. Marvel. *Steel,* v. 114, March 20, '44, pp. 84-85, 113.

Two hundred and five sizes will cover 95% of sizes required for airframes, although 328 sizes are ordered. Standardization of other aircraft types now regarded as desirable.

23-96. **Measuring Errors in Involute Spur Gears.** Sidney Cornell. *Iron Age,* v. 153, March 23, '44, pp. 68-73, 144.

In order to set up measuring standards for spur gears, the author presents a picture of an ideal gear which has no errors, and using this imaginary gear as a reference point skillfully presents a general classification of spur gear errors and outlines a method of recording and evaluating the deviations.

23-97. **Production Problems in Small Parts Manufacture.** C. P. Roberts and E. B. Neil. *Tool & Die Journal,* v. 9, March '44, pp. 89-93, 106-107.

The problems covered are based upon actual case histories taken from current production, and in most cases involve parts for aircraft or their components. Some emphasis has been placed upon the manufacture of aluminum parts since this metal not only is of the greatest importance in aircraft production but will have extensive post-war applications.

23-98. **Iron Roll Manufacture.** G. L. White. *Canadian Metals & Metallurgical Industries,* v. 7, March '44, pp. 16-20.

Well developed technique and close control essential to efficient production. Melting and molding process, hollow and special process rolls, finishing operations, roll characteristics.

23-99. **Methods in the Production of the Sten Gun Magazine.** *Machinery* (London), v. 64, Feb. 24, '44, pp. 197-202.

The magazine case is produced by spot-welding three steel pressings together.

23-100. **Aluminum in the Canning Industry.** *Light Metals,* v. 7, March '44, pp. 107-114, 115-116.

Aluminum as an improvement on tinplate; ultra-light alloys; historical; collapsible tubes and containers; improved collapsible container; the Bergerioux container; double-walled beer barrel; spiral seamed container; hair cream and office paste container; conical foil-lined paper containers for liquids; transparent collapsible containers; novelty packs; foil-covered glass containers; folding boxes of metallized board.

23-101. **The Light-Alloy Motorcycle.** "Slide Rule." *Light Metals,* v. 7, March '44, pp. 117-121.

Materials and methods which can be used with advantage by the competent amateur mechanic in search of increased performance.

23-102. **Aluminizing Telescope Reflectors.** *Light Metals,* v. 7, March '44, pp. 122-125.

Until recently, the production of metallic films on glass and other bodies by evaporation (and cathodic sputtering) was confined for technical reasons to objects of comparatively small area. The development, however, of high-capacity vacuum pumps has removed certain earlier difficulties and there is now virtually no size limitation in the application of the technique.

23-103. **Sports Equipment Offers Big Chances for Light Metals.** *Light Metals,* v. 7, March '44, pp. 127-130, 131-147.

A wide field of application for aluminum and magnesium alloys. Major items included in this section are tennis, golf, and winter sports.

23-104. **The Twin-Engined Monoplane Albemarle I and II.** *Metallurgia,* v. 29, Feb. '44, pp. 175-176.

Designed especially to meet what were, in the early days of the war, considered very real dangers (i.e., acute shortage of light alloys and other specialized aircraft materials, together with experienced aircraft manufacturing facilities), the Albemarle has been used for a variety of purposes, the most important being that of glider tug.

23-105. **Effect of the War on Railway Car Development.** E. D. Campbell. *Railway Mechanical Engineer,* v. 118, March '44, pp. 113-115.

New materials discussed—future of the freight car.

23-106. **Develop Single Shield Wire H-Frame Design.** *Electric Light and Power,* v. 22, no. 3, March '44, p. 63.

Saves 16,000 lb. of galvanized steel wire on first line. Other factors prevent adoption as standard practice in normal times.

23-107. **Chain Cables.** T. Scott Glover. *Welding,* v. 12, Feb. '44, pp. 91-98.

Manufacture of chain cable up to the present time and the importance of welding in this industry. 3 ref.

23-108. **The Production of the Sten Gun.** *Machinery (London),* v. 64, Feb. 17, '44, pp. 169-173.

Press-tool operations on the magazine.

23-109. **Manufacture of Steel Cartridge Cases.** *Machinery (London),* v. 64, Feb. 17, '44, pp.175- 180.

Duties which determine the required properties of material, necessity for checking material, stripping arrangement, trimming prior to final draw, the "detearing" unit.

23-110. **Post-War Prospects for the Machine-Tool Industry.** *Machinery (London),*v. 64, Feb. 17, '44, pp. 191-192.

How to deal with surplus machines, and post-war prospects.

23-111. **Fabrication of Bofors Top Carriage Gun Table at Midland Steel Products Company.** W. N. Robinson. *Steel Processing,* v. 30, March '44, pp. 147-153.

Forming the bearing ring; blanking, heating and forming base; furnace for heating base discs; welding bearing ring to base; fabrication of housing; bearing;

stress relieving furnace; description of furnace; operation of furnace; temperature cycle.

23-112. **Shipbuilding and Light Alloys.** E. C. Goldsworthy. *Engineers' Digest,* v. 1, March '44, pp. 242-245.
Value of weight savings, non-structural applications, machinery—main and auxiliary, research. 7 ref.

23-113. **Chain and Chain Repairs.** F. W. Shaw. *Iron & Steel Engineer,* v. 21, March '44, pp. 44-52.
Chains should receive the same care given any high grade piece of equipment. Most failures are due to abuse or to lack of proper inspection and repairs.

23-114. **Sten Gun Manufacture.** *Machinery* (*London*), v. 64, March 2, '44, pp. 225-229.
Production of ejectors, back sights and barrel seats.

23-115. **Tool Design and Improvisation.** O. H. P. *Machinery* (*London*), v. 64, March 2, '44, p. 237.
How time factor dominates aero-engine industry.

23-116. **The Design and Care of Ball Bearings.** *Machinery* (*Lloyd*), v. 16, March 4, '44, pp. 46-48.
Failure can generally be traced to causes which may be grouped under the following headings: Drawing office, workshop, operating or lubrication faults. Each is briefly discussed.

23-117. **Light Alloys After the War.** *Chemical Age,* v. 50, March 4, '44, pp. 231-232.
Development of markets in Britain.

23-118. **The Economical Use of High-Speed Steel.** James Farmer. *Machinery* (*London*), v. 64, March 9, '44, pp. 259-262.
How to make the best use of stocks, and what to do with tools that have become too short. Economical length of tool. British high speed steels, the correct use of the various grades.

23-119. **A Unique Silver and Steel Stamping Assembly.** J. Walter Gulliksen. *Modern Industrial Press,* v. 6, March-April, '44, pp. 18-20, 22.
Development of steel piston pin plugs drawn from sheet steel and replacing plugs machined from solid aluminum rod, used in the ends of the piston pins of aircraft engines.

23-120. **The Antiquity of Tools.** Joseph Danforth Little. *Metal Finishing,* v. 42, April '44, pp. 208-209, 233.
History of the drill, saw and chisel.

23-121. **A Stove Builder Makes Bombs.** Gerald Eldridge Stedman. *Modern Machine Shop,* v. 16, April '44, pp. 124-130, 132, 134.
American Stove Co. converts floor spare, porcelaining ovens, pickling facilities and other equipment to the fabrication of 500-lb. general purpose bombs.

23-122. **Anti-Friction Bearing Selection for Varying Load Conditions.** Kenneth N. Mills. *Product Engineering,* v. 15, April '44, pp. 250-252.
Engineering computations that enable better selection of anti-friction bearings for machines in which loads vary are exemplified with a hoisting machine for removing pipe from an oil well. The general considerations in bearing selection are outlined.

23-123. **Man-Hours Reduced 48% by Better Jigs and Fixtures.** *Tool Engineer,* v. 13, April '44, pp. 77-83.

Combining limited metal-working experience with keen understanding of production factors, a leading tire manufacturer has applied common-sense tooling ideas to building Bofors anti-aircraft guns. Practical methods described here may be helpful in other fields.

23-124. **Magnesium in Aircraft.** J. C. Mathes. *Automotive Industries,* v. 90, April 1, '44, pp. 31, 67-68.

Stress corrosion, riveting practice, arc welding practice, service experience, inspection of arc welded joints, primary structures.

23-125. **Metal Bellows.** G. Eldridge Stedman. *Steel,* v. 114, April 3, '44, pp. 116-118, 160, 162.

Unusual metal working operations in their manufacture.

23-126. **Mass Production of Fine Pitch Gears.** *Iron Age,* v. 153, April 6, '44, pp. 55-56.

By accurately controlling the blank dimensions and the roughing operations on the teeth, it has been found that shaving gives a sufficiently smooth and accurate finish to eliminate the necessity of burnishing. Pitch diameter tolerance on these gun director gears is 0.001 in.

23-127. **Mine Readers.** Max G. Boehm and C. Wisner. *Die Casting,* v. 2, April, '44, pp. 26, 28-30.

Current necessity for mass production of parts using methods involving minimum man-hours, and the accent on quality and interchangeability of various spare parts in the field has brought die casting into its own, and these techniques will be used in the post-war radio industry.

23-128. **Machining Brass for Bearing End Plate.** *Die Casting,* v. 2, April '44, pp. 33-34.

The example of machining brass die castings makes it clear that they lend themselves well to parts of high precision even though dimensions as-cast are not commonly as close as can be held on die castings of lower melting point metals.

23-129. **Engineered for Machining.** John R. Ehrbar. *Die Casting,* v. 2, April '44, pp. 39-42.

Certain economies are generally recognized as inherent advantages of die castings. These include, among others: less machining, fewer parts, faster production and assembly, lower investment in dies and in fabricating and finishing machines.

23-130. **Wear-Resisting Materials for Lathe Construction.** R. W. Dayton, C. H. Lorig and R. E. Adams. American Society of Mechanical Engineers *Transactions,* v. 66, April '44, pp. 199-204.

It was found, from tests of all the materials now in general use as the bearing surfaces of lathes, that the combination of hardened steel and alloy cast iron was far more wear-resistant than others and was adequately scoring-resistant. A process referred to as "flame refining" was developed for improving the wear resistance of cast iron.

23-131. **Wing Tips.** *Steel,* v. 114, April 17, '44, pp. 82, 84.

Continuing research in aluminum alloys keeps light metal in fore in aircraft applications. New composite alloy permits reduction of 10,000 lb. in weight of heavy bomber, thereby increasing possible bomb load.

23-132. **Kirksite Molds for Plastics.** Carrel C. Sachs. *Iron Age,* v. 153, April 20, '44, pp. 71-75.

The results of tests made at Lockheed Aircraft Corp. to determine whether cast zinc alloy molds could be used in place of the much more costly alloy steel molds ordinarily used for plastics. The tests demonstrate that Kirksite can be used successfully for high pressure transfer molds and also for compression molding of laminates, using heated platens. Deep cavities can be hobbed in the zinc alloy provided it is first heated to 350° F.

23-133. **Core Recovery Devices Used in South Australian Drilling Practice.** C. F. Duffield. *Australasian Mining & Metallurgy Proceedings,* no. 131 & 132, Sept.-Dec. '43, pp. 207-214.

Diamond drill core-barrel, sample tube for percussion drill, sample tube with calyx cutter.

23-134. **Ingenious Mechanical Movements.** Charles F. Smith. *Machinery,* v. 50, April '44, pp. 164-165.

Dial transfer mechanism for use in a chain making machine. Function of the mechanism consists of picking up a piece of work and transferring it to a specified position.

23-135. **Cast Iron for Pressure Equipment.** E. S. Clark. *Metals & Alloys,* v. 19, April '44, pp. 864-868.

Because of its economy, machinability, and design flexibility, design engineers in the past have frequently specified cast iron for cylinders, valves, fittings, etc., required to hold liquids or gas under pressure, but have traditionally limited such applications to low-pressure equipment not involving close fits. In recent years the applicability of gray iron pressure castings has been considerably extended by the development of high-duty irons (of which Meehanite, discussed here, is a leading example), whose structures make them more leak-resistant and warp-resistant than old-time cast iron.

23-136. **Types of Belt Construction.** Fred L. Hooper. *Industrial Heating,* v. 11, April '44, pp. 571-572, 574, 576.

Woven wire conveyor belts for industrial applications.

23-137. **Industrial Equipment.** *Steel,* v. 114, April 24, '44, p. 116.

Washing machine, electrode holder, low-high temperature testing chamber, spot welding control, countersink cutters.

23-138. **Tool Steel Tubing Applications.** George Bissett. *Tool & Die Journal,* v. 10, April '44, pp. 91-95.

Intense competition expected to arise in the approaching post-war period will provide the greatest impetus in the use of tool steel tubing. Short cuts that aim toward getting products on the market ahead of competition will be the order of the day.

23-139. **Special Welding and Machining Fixtures Used on 99-Mm. Anti-Aircraft Gun Mounts.** J. R. Miller. *American Machinist,* v. 88, April 27, '44, pp. 117-124.

Breakdown of major assemblies into small components and the preparation of complete work instruction cards simplifies production of gun carriages.

23-140. **Materials and Equipment for Stores.** George Schwartz. *Architectural Record,* v. 95, April '44, pp. 106-108.

Practical suggestions from operating and maintenance experience of a chain store consultant.

23-141. **Production of Stainless Steel Exhaust Manifolds at Buhl Stamping Company.** W. N. Robinson. *Steel Processing,* v. 30, April '44, pp. 213-216.

Stampings produced on hard dies; cleaning and drying operations; welding; sand blasting and inspection.

23-142. **Self-Sharpening Machine Knives.** *Oxy-Acetylene Tips,* v. 23, April '44, p. 59.

Self-sharpening mill knives can be made inexpensively from steel plate by any well-equipped welding or machine shop, through the use of Stellite cobalt-chromium-tungsten hard-facing rod.

23-143. **Light Alloys in Metal Rectifiers.** *Light Metals,* v. 7, April '44, pp. 162-172.

The theory and practice of the use of aluminum and magnesium in metal rectifiers.

23-144. **Sports Equipment Offers Big Chances for Light Metals.** *Light Metals,* v. 7, April '44, pp. 179-206.

Fishing tackle and accessories, and equipment for various athletic pastimes.

23-145. **The Production of the Sten Gun.** *Machinery* (London), v. 64, March 16, '44, pp. 281-285.

Methods employed at a Royal Ordnance Factory.

23-146. **Diesel Engines in Wartime Navy.** Lisle F. Small. Society of Automotive Engineers *Journal,* v. 52, May '44, pp. 198-201, 224.

Direct coupling of the propeller shaft with the engine versus the indirect drive; welded steel construction; torsional vibration of shafting; spare parts; and gas turbines.

23-147. **Building Superchargers at General Electric Ft. Wayne Plant.** Howard Campbell. *Modern Machine Shop,* v. 16, May '44, pp. 124-132, 134.

Principal manufacturing operations on the airplane engine turbosupercharger.

23-148. **Used Ball Bearings Perform Vital War Duty.** Roger W. Bolz. *Modern Machine Shop,* v. 16, May '44, pp. 206, 208.

Procedures for cleaning, handling and housings.

23-149. **Short Circuit Welding Licks Difficult Lubricating Job in Assembling Droppable Fuel Tanks.** G. Eldridge Stedman. *Steel,* v. 114, May 8, '44, pp. 100-101, 158-161.

Auxiliary droppable fuel tanks of 24-gage terne plate, lead-coated steel. The deepest draw is 10.75 in.; it has an elliptical and tear-drop shape, so it is produced in two half-shells which are seam welded to form the complete droppable tank.

23-150. **Developments in Car Equipment for Streamline Trains.** *Railway Age,* v. 116, April 22, '44, pp. 770-775.

Use of new materials and spectacular innovations in the design of modern light-weight cars.

23-151. Weighed in the Balance. K. H. Booty. *Die Casting,* v. 2, May '44, pp. 19-20, 22-24.

With comparatively low rate of production, as compared with other industries, Central Scientific Co., manufacturers of laboratory scales and apparatus, finds other attributes of die castings to be so valuable in solving design problems they far outweigh the disadvantage of low production rates.

23-152. **Cleaner Die Castings.** George H. Scott. *Die Casting,* v. 2, May '44, opposite p. 24, 3 pp.

Top executive of a vacuum cleaner plant has gone from postwar planning to postwar action; and sees die castings in a role of growing importance.

23-153. **Beryllium-Copper Springs.** Sheldon C. Klock. *Electronic Industries,* v. 3, May '44, pp. 108-109, 282, 284, 285.

Production control methods necessary in applications of beryllium-copper in electric equipment.

23-154. **The Production of High-Speed Helical Gears, with Special Reference to the Elimination of Transmission Noises.** S. A. Couling. *Institution of Mechanical Engineers,* v. 150, March '44, pp. 172-177.

Experience gained in the production of quiet-running high-speed helical gears; sources of gear noise, and the early attempts at their elimination. Hobbing machines with the indexing wormwheel and table solid are advocated, as opposed to machines having the "creep" mechanism.

23-155. **Standardization of Steel Tubing Sizes for Air-**craft. John W. Offutt and David T. Marvel. *Aero Digest,* v. 45, April 15, '44, pp. 92, 218.

Strength-weight factor is the dominant consideration in the choice of material for use in airplanes. Airplane designer must hold the dead weight of the plane to the irreducible minimum, calculate the stresses of each member accurately and then select materials and part sizes that will safely withstand these stresses.

23-156. **Aircraft Requirements of Steel Castings.** V. N. Krivobok. *Metal Progress,* v. 45, May '44, pp. 889-891.

About one-third the weight of a modern fighter's fuselage is steel, and castings comprise a substantial fraction of this. Principal requirements, and the "cast-versus forging" problem.

23-157. **Streamlined Production.** *Tool Engineer,* v. 13, May '44, pp. 74-82.

Tooling up for 3000 jobs a month; ingenious use of special and standard machines results in efficient high production; well-designed jigs aid mass production; grinding hydraulic piston rods; hand miller with indexing fixture; brazing lowers costs; "in-line" production on burring jobs; pneumatic controls on machine and clamp actuation; crimping tube fittings onto hose ends; handling materials for anodizing.

23-158. **Bearing Design Simplified by Use of Clearance Ratios.** L. M. Tichvinsky. *Product Engineering*, v. 15, May '44, pp. 323-326.

Bearing clearance data for various types of rotating machinery. Lower and upper clearance limits are indicated with their effect on the journal bearing performance involving the coefficient of friction and minimum oil film thickness. Also a method for measuring the bearing clearance. 5 ref.

23-159. **Power Trains for Medium Tanks.** Lloyd Lenox. *Modern Industrial Press*, v. 6, May '44, pp. 18, 22.

Adoption of normal automotive manufacturing facilities and techniques to the building of war machines which, although vastly bigger in scale, required the utmost precision in machining and assembly. Numerous examples of this facility are found in the tank and aircraft programs.

23-160. **International Unification of Bearings.** H. Tornebohm. *Industrial Standardization*, April '44, pp. 63-66.

History of national bodies developing bearing standards; international conferences; boundary dimensions of ball and roller bearings; tolerances of thrust bearings; future needs.

23-161. **Improved Explosive Rivet.** *Iron Age*, v. 153, May 18, '44, p. 65.

Explosive rivet that fits itself to the hole. Present application for military aircraft; eventually it is expected to have many postwar uses in the fabrication of such products as radios, refrigerators, etc.

23-162. **Studebaker Production of 2½-Ton Military Trucks.** Joseph Geschelin. *Automotive Industries*, v. 90, May 15, '44, pp. 26-28, 82, 86.

Built to Government specifications, the Studebaker military trucks have incorporated in them standard and interchangeable components. The production lines perform essentially assembly functions. Studebaker is unique in producing its own leaf springs. Mass production character of the operation has made it feasible to utilize assembly conveyors.

23-163. **Automatic Control, Centralized Distribution Solve Rivet Troubles.** C. O. Davis. *Automotive Industries*, v. 90, May 15, '44, pp. 30-32, 112, 114.

The procurement, handling, storage, distribution and conservation of both DD (icebox) and AD rivets; establishment of entirely new procedures for rivet handling based on a centralized storage, packaging and distribution area.

23-164. **What's the Future of the Gas Turbine?** F. K. Fischer and C. A. Meyer. *Machine Design*, v. 16, May '44, pp. 99-100.

The future application of the gas turbine depends upon developments in the field of metallurgy, aerodynamics, combustion and heat exchange.

23-165. **Gauging the Tooth Thickness of Helical Gears.** A. Ryding. *Machinery* (London), v. 64, April 6, '44, pp. 371-373.

Mathematical determination of dimension M for a helical gear.

23-166. **Development and Application of Military and Special Steels for Ordnance Purposes.** Col. John H. Frye. American Iron and Steel Institute Advance Paper, May 25, '44, 21 pp.

Distribution of steel to Army and civilian uses. Survey of production of ordnance items and accomplishments of various branches of the Ordnance Department in new products and processes, conservation of scarce metals, handling methods and shipping containers.

23-167. **Wrought and Cast Magnesium for Airframes.** V. N. Krivobok. *Metal Progress,* v. 45, June '44, pp. 1104-1110, 1132.

Considers, from a metallurgical viewpoint, the proposal that wrought and cast magnesium might be more extensively used in fighting airplanes.

23-168. **Manufacture of Homogeneous Armor, Both Cast and Rolled.** D. O. Davis. *Metal Progress,* v. 45, June '44, pp. 1081-1087.

Changes in peacetime operations necessary to produce gun tubes, armor plate and other heavy ordnance material at Dominion Foundries & Steel, Ltd.

23-169. **Needle Roller Bearings.** E. V. Paterson. *Automobile Engineer,* v. 34, April '44, pp. 147-150.

Notes on their application and maintenance.

23-170. **Producing Jackets and Primers for 0.30 Cartridges.** *Machinery* (London), v. 64, April 13, '44, pp. 393-401.

Manufacture of the bullet jackets and primers; the assembly of the bullets and of the complete cartridges; and the automatic weighing and inspection of the finished cartridges.

23-171. **Steel Separators for Gun Mount Bearings.** *Iron Age,* v. 153, May 25, '44 p. 45.

Substitution of pressed steel roller separators for bronze separators has resulted in considerable weight saving in large size thrust and radial bearings.

23-172. **Twelve General Considerations for Needle Bearing Applications.** Walter H. Korff. *Product Engineering,* v. 15, June '44, pp. 389-392.

High load-carrying capacity and small space requirements are among the advantages of needle bearings for many applications. Limitations and differences in characteristics from other types of bearings are included.

23-173. **Light Alloy Pistons.** C. Wilson. (*Automobile Engineer,* v. 34, Feb. '44, pp. 53-8.) *Engineers' Digest,* v. 1, May '44, pp. 337-339.

Materials, forging methods, molding technique, press forming, molding dies.

23-174. **Larger Output of Zinc Alloy Die Castings in Years Following End of War Envisioned.** S. E. Maxon. *Metals,* v. 14, May '44, pp. 6-7, 11.

Sees enormous demand for consumer and industrial items; more and better facilities now available to meet needs.

23-175. **The N. E. Steels in the Post-War Era.** Edwin F. Cone. *Metals & Alloys,* v. 19, May '44, pp. 1122-1128.

The primary question about NE steels is: "Are they here to stay or will they be largely replaced after the war?" 8600 and 8700 series are expected to be the "fair-haired" boys. Reasons for a lessened relative post-war demand will be (*a*) the fussier heat treating behavior of the NE steels, (*b*) the psychology of favoring the familiar over the new or strange, (*c*) NE steel over-pricing, so that either the lower prices of the "needled" carbon steels or the better properties of the higher alloy steels become more attractive, and (*d*) sales pressure from the alloy producers.

23-176. **Fabricating and Finishing the New M-1 Soldier's Helmet.** *Metals & Alloys*, v. 19, May '44, pp. 1137-1140.

A pictorial description.

23-177. **Spark - Gap Converters.** Frank T. Chesnut. *Metals & Alloys*, v. 19, May '44, pp. 1155-1156.

Concise engineering information about the applicability of spark-gap converters.

23-178. **What's the Future for "Maggie".** W. B. Griffin. *Light Metal Age*, v. 2, May '44, pp. 15-18.

List of potential post-war consumers and uses of magnesium, which has been compiled from the information gathered from recent business surveys; direct contact with prospective consumers and present users.

23-179. **Ancient Speculum Returns to Provide Tomorrow's Spoons and Forks.** *Tin & Its Uses*, No. 15, March '44, pp. 9-10.

The use of Speculum to meet a war demand promises to precipitate a revolution in post-war tableware.

23-180. **Gear Manufacturers Approve New Standards.** *Iron Age*, v. 153, June 1, '44, pp. 59-61.

New officers elected, statistical method favored, contact pressure analyzed, bearing problems, postwar labor conditions.

23-181. **Mass Production of Small Fine Pitch Gears.** *Machine Tool Blue Book*, v. 40, June '44, pp. 183-184, 186, 188, 190.

Bringing mass production methods such as "gear-shaving" along with extremely high standards of precision into the field of manufacturing small fine-pitch gears for high precision military instruments by Ford Motor Co.

23-182. **Burgess Norton Now Produces Aviation Piston Pins and Tank Treads.** Joseph Geschelin. *Automotive Industries*, v. 90, June 1, '44, pp. 18-21, 152, 154.

Plant operation has been divided into a number of self-contained departments. First is the machine shop in which the variety of pins are prepared in the "soft" stage. Next is a comprehensive heat treating department featuring some of the most advanced equipment and metallurgical methods known to the art. And finally there is the finishing department for handling grinding, honing, lapping, etc.

23-183. **A Wartime Conversion.** D. W. Powers. *Die Casting*, v. 2, June '44, pp. 19-21, 48-50.

Use of die castings in the manufacture of field telephones was inaugurated by the Signal Corps, U. S.

Army, in an attempt to conserve critical raw materials. Describes some of the designs successfully employed.

23-184. **A War Housing Project.** *Die Casting,* v. 2, June '44, pp. 22-24.

Eclipse-Pioneer Division of Bendix Aviation Corporation has found die casting is superior to high grade sand castings for well over 100 applications in instruments and other products.

23-185. **The Use of Die Castings in the Small Motor Industry.** Howard F. Doll. *Die Casting,* v. 2, June '44, pp. 36-41.

Die casting is not only the most advantageous process for the production of housings, but is virtually the only sound basis for high volume precision production in this field.

23-186. **Switch to Die Castings.** A. L. Riche. *Die Casting,* v. 2, June '44, pp. 54-55.

In many applications the die cast housing serves both as mechanical protection and also as a functional support for operating mechanisms. Example described is condulet for micro switch case.

23-187. **Quick-Acting Fasteners.** R. W. Allen. *Steel,* v. 114, June 19, '44, pp. 100, 130.

Developed for aircraft use, they may find many peace-time applications.

23-188. **Refrigerated Barges Made by National Iron Works.** Harold Keen. *Western Metals,* v. 2, June '44, pp. 32-33, 35.

There is no precedent for these particular refrigerated barges, erected in unique knockdown fashion.

23-189. **Light Metals in the Automobile.** E. V. Pannell. *Light Metals,* v. 7, May '44, pp. 209-213.

Standardization, importance of light weight, how the light car performs, does the light car hold the road, the light metals available, design of the light-alloy car.

23-190. **Light Alloys in Marine Engineering.** E. C. Goldsworthy. *Light Metals,* v. 7, May '44, pp. 218-221.

Possible applications of light alloys, together with their advantages.

23-191. **Aluminum and Magnesium in the Electrical Industries.** B. J. Brajnikoff. *Light Metals,* v. 7, May '44, pp. 221-223.

Use of the light alloys in electrical engineering. The application of aluminum for overhead transmission lines. Steel-cored aluminum cable will probably eventually be displaced by "solid" conductors of light alloys of special composition.

23-192. **Light Metals in the Medical Sciences.** *Light Metals,* v. 7, May '44, pp. 224-235.

Commonplace and unusual applications of these materials, as for example in dentistry.

23-193. **Copper Conductors for Transmission Lines.** *Engineering,* v. 157, May 5, '44, pp. 352.

Main types of hollow conductor.

23-194. **Mass Production Techniques Are Applied to Intricate Assemblies.** William H. Hilmer. *Steel,* v. 114, June 26, '44, pp. 103-104, 106, 108.

Martin reduces number of man-hours required for assembling 26-ton patrol bombers by 61.5% in 18 months by use of universal riveting.

23-195. **Automotive Gears.** *Lubrication,* v. 30, June '44, pp. 57-64.

The cash value, types of gears, transmission design, the final drive and differential, how the gears are made, lubricating the automotive gear, maintenance and lubrication, how the laboratory evaluates a gear lubricant.

23-196. **Steel, Yesterday, Today and Tomorrow.** R. E. Zimmerman. *Metal Progress,* v. 46, July '44, pp. 75-78.

A conservative appraisal of the future uses of steel products as affected by the research and technical developments of the recent war years.

23-197. **Index of Uses for National Emergency Steels.** *Metal Progress,* v. 46, July '44, pp. 91-96.

Classification by NE numbers. Alphabetical list by uses. Chemical specifications and hardenabilities of NE steels.

23-198. **Producing Jackets and Primers for 0.30 Cartridges.** *Machinery* (London), v. 64, April 13, '44, pp. 393-401.

Manufacture of the bullet jackets and the primers; the assembly of the bullets and of the complete cartridges; and the automatic weighing and inspection of the finished cartridges.

23-199. **Fabricating Steel Invasion Mats.** *Steel Processing* v. 30, June '44, pp. 349-352.

Crimping; transverse units; painting and baking; side shields; wire staples used for reinforcing; buffer shields.

23-200. **The Z-Type Crankshaft.** F. E. Swain. *Automobile Engineer,* v. 34, May '44, pp. 206-207.

Cylinder disposition reviewed from a new angle.

23-201. **Gas Turbines.** *Iron & Steel,* v. 17, May '44, pp. 365-366.

The properties of steels and some other alloys suitable for temperatures up to about 550° C., and for temperatures of from 600° C. to well over 1000° C. Resistance to high temperatures, stresses and erosion are the primary requirements of the alloys used.

23-202. **Gage Control Cuts Production Costs.** Wallace A. Scotten. *Tool Engineer,* v. 14, July '44, pp. 67-69.

Motion economy applied to handling of gages, salvaging of rejects, and maintenance of inspection tools saves thousands of manhours.

23-203. **Metal Life Rafts: Tooling and Production.** Glenn Schwander. *Tool Engineer,* v. 14, July '44, pp. 89-92.

Specially designed jigs and fixtures cut assembly time on an unusual stamped metal product.

23-204. **Plastic Tooling Value Proved by Aircraft Production.** Harry W. Tompkins. *Tool & Die Journal,* v. 10, July '44, pp. 123-126, 128.

Value, uses, and cost history of plastic tools.

23-205. **Pratt & Whitney Aero-Engines and Turbo-Superchargers.** *Machinery* (London), v. 64, June 8, '44, pp. 617-620.

Ford production methods.

23-206. **Improvements in Metal Stitching Extend Its Use to Load-Bearing Structures.** G. W. Birdsall. *Steel*, v. 115, July 10, '44, pp. 84-87, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150.

Stitching wire and stitching machines now available no longer limit this comparatively new method to making metal-to-metal joints for use only in non-stressed applications. Extension of the process to semi-stressed and lightly loaded structures is a reality. Further important expansion in joining primary structures is predicted because of uniformly high physical properties now obtainable.

23-207. **Production of B.S.A.-Namco Ground-Thread Circular Chasers.** *Machinery* (London), v. 64, June 15, '44, pp. 645-649.

Operation schedules and necessary equipment.

23-208. **Good Mixers.** H. E. Metz. *Die Casting*, v. 2, July '44, pp. 20-22, 66-67.

Use of die castings to produce a more efficient, economical and esthetic product.

23-209. **Development of Special Steels for Naval Use.** E. G. Touceda. *Blast Furnace & Steel Plant*, v. 32, July '44, pp. 807-810.

Acceptability of steel for specific application; statistical analysis of test data as applied to the development of steel specifications.

23-210. **Railroad Structural Materials.** S. L. Hoyt and H. W. Gillett. *Railway Age*, v. 117, July 8, '44, pp. 83-86, 89.

Metallurgical aspects of the present status and future improvements in locomotives and cars.

23-211. **Electrical Steel for Transformers.** C. C. Horstman. *Westinghouse Engineer*, v. 4, July '44, pp. 120-123.

Electrical steel application to high-frequency transformers demands thinner gage core laminations to reduce eddy current losses. Permeability decreases and hysteresis loss increases with reduction in gage. Hipersil, in paper-thin ribbons for radio transformers, has these properties. 2 ref.

23-212. **Weber-Built All-Metal Life Rafts Compartmented Like Battleship.** *Modern Industrial Press*, v. 6, June '44, pp. 24, 26, 42.

Made of 16 gage cold rolled steel, each raft is separated into 19 airtight compartments, plus two airtight water tanks. Food and equipment are stored in four compartments near the center, and are reached through large openings in the side of the well deck. The openings are bolted closed by means of screws, which may be removed in a couple of minutes.

23-213. **A.G.M.A. Tentative Standard System Fine-Pitch Straight Bevel Gears.** *Product Engineering*, v. 15, July '44, pp. 473-476.

This tentative standard was adopted by the Ameri-

can Gear Manufacturers Association at their annual meeting, May 22-24, 1944.

23-214. **Modern Rolling Stock Materials.** Stephen H. Badgett. *Railway Age*, v. 117, July 15, '44, pp. 112-117, 124.

Passenger-car construction that has resulted in the development of the modern de luxe coach and the materials available for the future.

23-215. **Metallurgy of Spring Manufacture.** *Canadian Metals & Metallurgical Industries*, v. 7, July '44, p. 43.

Materials used; failures result from application of stresses beyond the limit of the springs; proper design; two methods of manufacture.

23-216. **Light Alloys in Metal Rectifiers.** *Light Metals*, v. 7, June '44, pp. 276-284, 285-296, 297, 298.

Selenium rectifier and the use made of light metals in its construction.

23-217. **Aluminum and Magnesium in the Electrical Industries.** *Light Metals*, v. 7, June '44, pp. 300-304, 306-308.

Analyzes the respective uses of steel-cored aluminum, and aluminum-base alloys for transmission lines.

23-218. **Helical Spring Calculations.** I. A. J. *Machinery*, (London), v. 64, May 25, '44, pp. 567-573.

Tables and worked examples.

23-219. **The Machine Tools Outlook.** Tell Berna. *Aero Digest*, v. 46, July 1, '44, pp. 58-59, 134, 136.

Top production in machine tools was reached in 1942. Demand fell off slightly in 1943, and total output for 1944 is expected to be less than half of that for 1942.

23-220. **Applications of High Temperature Conveyor Belts: I.** S. Craig Alexander. *Industrial Heating*, v. 11, July '44, pp. 1074, 1076, 1078, 1080, 1082.

Materials used in the construction of conveyor belts, types of belt construction, the factors which influence the selection of a particular design of belt or a belt-metal of a certain composition to meet specific service conditions, and the numerous ways in which conveyor systems can be installed to meet individual requirements.

23-221. **Flying Conestogas.** *Welding Engineer*, v. 29, July '44, p. 52

Welding stainless steel replaces riveted Al alloy sheets on new Navy cargo plane built by Budd Mfg. Co.

23-222. **Metal Patterns.** W. C. Perry. *Iron and Steel*, v. 17, June '44, pp. 488-490.

Their production for fighting vehicles.

23-223. **Caesium and its Application to Photo-Electric Cells.** A. G. Arend. *Metallurgia*, v. 30, May '44, pp. 7-9.

Extraction process outlined and attention is directed to the use of the metal in photo-electric cells.

23-224. **Self-Contained Power Trains.** C. M. Laffoon. *Steel*, v. 115, July 31, '44, pp. 80, 82, 114.

Broad requirements for metallic materials and components made from them are represented in new emergency electric plants.

23-225. **Lattice Girder Construction.** C. S. Sheperd. *Iron & Steel Engineer,* v. 21, July '44, pp. 52-53.
Crane bridges using single web lattice construction for both main and auxiliary girders.

23-226. **Wright Aero Produces Engines for the B-29 Superfortresses.** K. E. Sutton. *Machinery,* v. 50, August 44, pp. 134-143.
2200-horsepower engines built by modern manufacturing methods.

23-227. **Die Castings for Airacobras Ring the Bell.** *Die Casting,* v. 2, August '44, pp. 25-27, 56.
Thousands of man-hours and considerable machining equipment saved.

23-228. **Style and Efficiency in Heat Control Devices.** *Die Casting,* v. 2, August '44, pp. 28-29.
Die castings used for efficiency of manufacture and stylizing possibilities.

23-229. **Aluminum Die Casting Alloys for Marine Applications.** *Die Casting,* v. 2, August '44, pp. 40-43, 61-62.
Aluminum alloys discussed in regard to physical properties and characteristics as a guide to the selection of the proper alloy for specific applications. Navy Specification 46A14 (INT).

23-230. **Non-Ferrous Alloy Blanking Dies.** *Iron Age,* v. 154, August 3, '44, pp. 46-49, 132, 134.
British practice in the use of non-ferrous alloys for aircraft dies traced from the early use of high strength die casting alloys to the development of K.M. alloy. Tool and die design as well as template production discussed.

23-231. **Making Zinc Alloy Aircraft Forming Dies.** Gerald E. Stedman. *Metals & Alloys,* v. 20, July '44, pp. 83-88.
Practical details of the techniques and methods employed to make zinc alloy blanking and forming dies at a large midwestern aircraft plant.

23-232. **NE Steels in Oil Well Drilling Equipment.** Blaine B. Wescott. *Metal Progress,* v. 46, August '44, pp. 291-294.
NE 8700 steels satisfactorily substituted for S.A.E. 3100 and 4100 steels formerly used for tool joints and drill collars, and for S.A.E. 4800 steels formerly used for rock bits. No acceptable substitute has been found to give the corrosion resistance of 1.5% Ni steels, required for sucker rods.

23-233. **How United States Designers Shift to Use of NE Steels.** O. L. Mesenhimer. *Steel,* v. 115, August 7, '44, pp. 98, 101, 160.
Highly stressed parts such as diesel engine studs employ substitute steels in program closely keyed to Navy requirements and to production problems.

23-234. **Carbon-Brush Contact Films: II.** C. Van Brunt. *General Electric Review,* v. 47, August, '44, pp. 28-35.
Striking effect of oxygen on cuprous oxide contact films. Adjuvants, or substitutes, for film carbon lubrication at high altitudes. What experiments with brass collectors have taught.

23-235. **Use of Alloy Steels Foreseen for Railroad Equipment.** S. L. Hoyt and H. W. Gillett. *Iron Age*, v. 154, August 10, '44, pp. 52-55.

Metallurgical factors involved in the use of liquid quenched steels in place of the low carbon steels traditionally used for rolling stock construction. The part that welding can play in reducing weight.

23-236. **Non-Ferrous Alloy Blanking Dies.** *Iron Age*, v. 154, August 10, '44, pp. 58-62.

British zinc alloy die practice. Description of tool and die design and the procedures followed in the full scale layout system for the accurate reproduction of light metal parts.

23-237. **Low Tin Babbitted Bearings.** T. E. Eagan. *Iron Age*, v. 154, August 10, '44, pp. 64-66.

Techniques developed in bonding processes, such as the Kolene process for cast iron backings, and the use of a highly satisfactory lead-arsenic bearing metal are given prominence.

23-238. **Locomotive Axleboxes.** E. S. Cox. *Engineering*, v. 158, July 21, '44, pp. 58-60.

Design, manufacture, operation and maintenance of bearings.

23-239. **Non-Ferrous Alloy Blanking Dies.** *Iron Age*, v. 154, August 17, '44, pp. 74-80.

Manufacture of zinc alloy dies. Trial runs on blanking steel up to 18 SWG indicate a die life of about 500.

23-240. **Materials Available for Modern Rolling Stock.** Stephen H. Badgett. *Railway Mechanical Engineer*, v. 118, August '44, pp. 356-361.

Variety of materials has made possible the lightweight car. The future will offer still further weight-reducing designs.

23-241. **Production of Tubular Railway Axles.** H. A. Long. *Industrial Heating*, v. 11, August '44, pp. 1274, 1276, 1278, 1280, 1282, 1284, 1286.

Relative position of various units on the production line; equipment used.

23-242. **Applications of High Temperature Conveyor Belts. II.** S. Craig Alexander. *Industrial Heating*, v. 11, August '44, pp. 1242, 1244, 1246, 1248, 1250, 1252.

Woven wire conveyor belts for industrial applications.

23-243. **Plastics and Metals.** G. K. Scribner. *Metals & Alloys*, v. 20, August '44, pp. 336-341.

Shows the engineering and styling advantages and disadvantages of each and their probable future fields of competition and collaboration.

23-244. **Bathtub-Tested Landing Barges.** *Metals & Alloys*, v. 20, August '44, pp. 350-354.

A pictorial presentation.

23-245. **Mass Production Methods Are Applied Successfully in Making Fine-Pitch Gears for Precision Instruments.** K. E. Bauerle. *Steel*, v. 115, August 28, '44, pp. 80-83, 120, 122.

Mass production methods and modern gear finishing processes give a very high degree of uniform accuracy.

23-246. **Production of Torpedo Center Units Requires Heavy-Duty Equipment.** Carl G. Preis. *American Machinist*, v. 88, August 31, '44, pp. 111-116.

Amertorp Corp. plant equipped to make torpedoes used from aircraft, surface vessels and submarines. Consisting of some 5,000 precision-made parts, an airborne torpedo weighs more than a ton and costs approximately $12,000.

23-247. **The Mighty Jeep.** *Steel Processing*, v. 30, August '44, pp. 485-489, 503.

Fabrication and assembly at Willys-Overland Motors.

23-248. **Bearing Metals in the Steel Industry.** S. Epstein and R. C. Hess. *Iron & Steel Engineer*, v. 21, August '44, pp. 83-97.

Modifications in compositions of bearing metals necessitated by war shortages. Many of the improvements will be carried over into peacetime. The design and manufacture of bearings is as important as their composition.

23-249. **Design-Strengthened Materials and Their Applications.** Dimitry E. Olshevsky and Richard S. Smith. *Aero Digest*, v. 46, August 15, '44, pp. 117-118, 120-121, 131, 133.

Design-strengthening results in a material of superior strength and stiffness. Advantages of the application of D-S materials in aircraft construction. Production angles and joining methods are discussed. A general review of avialable sizes, alloys, tempers and patterns is made.

23-250. **Production of Drop-Off Tanks at Weber Showcase Co.** *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 12, 14, 58.

Streamlined, laminar flow drop-off tank.

23-251. **Job Shop Emerges.** G. Eldridge Stedman. *Steel*, v. 15, Sept. 4, '44, pp. 86, 88, 90, 92.

Fabrication of 45-ton, 12-wheel tank trailer for transport and recovery of Army tanks.

23-252. **Piston Rings Become Varied in Design, Material, Manufacture, Service, Uses.** Melvin W. Marien. *SAE Journal*, v. 52, Sept. '44, p. 52.

Two types of steel piston rings; steps in manufacture of rings.

23-253. **Marine Engines by Hendy.** Howard Campbell. *Modern Machine Shop*, v. 17, Sept. '44, pp. 124-130, 132, 134.

Story of the Joshua Hendy Iron Works, Sunnyvale, Calif.

23-254. **Notes on Screw Threads.** Harry F. Atkins. *Machinery* (London), v. 65, July 13, '44, pp. 46-47.

Strength and design of bolts and nuts.

23-255. **Messerschmitt Header Tank.** *Foundry Trade Journal*, v. 73, July 27, '44, pp. 255-257.

Examination of materials used in enemy aircraft.

23-256. **Post-War Buildings.** E. G. West and D. V. Pike. *Light Metals*, v. 7, August '44, pp. 361-368.

Theory and practice of the utilization of aluminum alloys in post-war building construction.

23-257. **The Production of Aircraft Stampings.** J. A. Cates. *Aircraft Production,* v. 6, August '44, pp. 362-368.

A review of the laboratory control and manufacturing methods of High Duty Alloys, Ltd.

23-258. **Deflection of Coiled Springs Wound with Initial Tension.** Harold Carlson. *Product Engineering,* v. 15, Sept. '44, pp. 619-621.

Physical factors and manufacturing considerations that affect the design of coiled springs wound with an initial tension. Formulas for computing deflection and torsional stress are included, also curves derived from test data which indicate range of initial tension obtainable in springs of different coil and wire diameters.

23-259. **Railway Equipment.** E. D. Campbell. *Mechanical Engineering,* v. 66, Sept. '44, pp. 605-608.

Potential uses of steels, aluminum, magnesium, and plastics.

23-260. **Fabrication and Assembly of the Weasel.** *Tool Engineer,* v. 14, Sept. '44, pp. 83-85.

Automatic babbitt; application; broach splits piston rod cap; hull welding fixture; special purpose boring machine.

23-261. **Heat Exchangers for Aircraft.** Arthur J. Hess. *Refrigerating Engineering,* v. 18, Sept. '44, pp. 192-195.

Types of aircraft heat exchangers. Fighting planes have complicated heat transfer problems.

23-262. **The Production of the Wickman 5-Spindle Automatic.** *Machinery* (London), v. 65, August 3, '44, pp. 113-120.

Factory layout; operations on castings.

23-263. **Results of Wartime Research on Babbitted Bearings.** T. E. Eagan. *Industry & Power,* v. 47, Sept. '44, pp. 76-78, 150, 152, 154.

Gravity cast and centrifugally cast bearings, proper methods of bonding, use of lead base bearings, a new two-bath cleaning process, bonding babbitt to cast iron, and effect of bearing thickness on bearing life.

23-264. **They Speak for Themselves.** Don H. Mitchell. *Die Casting,* v. 2, Sept. '44, pp. 20-22, 60.

Aluminum die casting the housing for radio set.

23-265. **Packaged Portable Power.** E. A. Jacobsen. *Die Casting,* v. 2, Sept. '44, pp. 23-25, 61.

In the design of small gasoline engines for large volume production, the use of die castings is a "perfect natural." Uniformity, thin sections, large fin areas, cast inserts, and minimum machining are the all-important points of advantage.

23-266. **Leakproof Bodies.** R. S. Taylor. *Die Casting,* v. 2, Sept. '44, pp. 26, 29.

Application of die castings to the Servel gas refrigerator; economy and efficiency of die casting.

23-267. **Packard Production of the Merlin Engine.** *Machinery* (London), v. 65, Aug. 17, '44, pp. 177-182.

The Packard Company assembles the Rolls-Royce

Merlin engine on a continuously moving line which progresses around an oval-shaped track. Sub-assemblies move down straight assembly lines to the point where they are attached to the engine itself.

23-268. **"All Secure": Screws, Bolts, Nuts, Rivets Are Ready to Cut Costs.** *Modern Industry,* v. 8, Sept. 15, '44, pp. 42-46.

New fasteners have characteristics that every industry can put to work.

23-269. **Flush Pin Gages Meet Stiff Ordnance Requirements.** Wallace L. Kimball. *American Machinist,* v. 88, Sept. 28, '44, pp. 91-94.

Ordnance gage experts advocate adoption by industry of this gage, which is simple and inexpensive, and which is not damaged in storage or shipment.

23-270. **Trends in the Development of Aircraft Engines.** M. W. Bourdon. *Automotive Industries,* v. 91, Sept. 15, '44, pp. 24-25, 116, 118, 120.

Sir Roy Fedden foresees gradual decline of reciprocating engine in favor of gas turbine for airplanes.

23-271. **Pistons of American, British, French and Russian Aircraft Engines.** *Automotive Industries,* v. 91, Sept. 15, '44, pp. 28-32, 34, 72, 74.

Analysis and comparative data presenting the results of an exhaustive study made in Germany.

23-272. **Aluminum Foil—Its Production, Properties and Applications.** *Light Metal Age,* v. 2, Sept. '44, pp. 16-19.

History, manufacture, properties, uses.

23-273. **Methods of Using Dowel-Pins in Precision Tool Design.** Eugene E. James. *Machinery,* v. 51, Sept. '44, pp. 186-188.

Tool-room doweling practice; designation of dowel-pins; applications of semi-blind and blind dowel-pins; number of dowel-pins required.

23-274. **Gyro Stabilizers.** *Steel,* v. 115, Sept. 25, '44, pp. 78-79, 120, 122, 124, 126, 128.

Permit accurate firing of guns while tanks are in motion; may provide "floating" rides in postwar high speed trains and automobiles as well as stabilize equipment parts.

23-275. **Improved Production Techniques Employed in Turning Out Opposed Piston Diesel Engines.** *Steel,* v. 115, Sept. 25, '44, pp. 82-84.

Important steps in manufacture of engine shown.

23-276. **Engine Bearings.** *Automobile Engineer,* v. 34, August '44, p. 313.

Requirements conducive to long life.

23-277. **Production of Steel and Brass Instrument Cases.** R. M. Brown. *Welding,* v. 12, August '44, pp. 363-367.

Fabrication of instrument cases from 16 S. W. G. mild steel, arc welded with "Transweld" shielded arc electrodes and from .062 alpha brass sheet manufactured by the carbon arc welding process without filler wire. Use of higher currents increased the welding speed and produced a better finish.

23-278. **Perishable Tools.** F. A. Lutz. *Army Ordnance,* v. 27, Sept.-Oct. '44, pp. 285-288.
Economies achieved in small-arms ammunition production.

23-279. **Notes on Magnesium Alloy Applications in Aircraft and Allied Industries and on Alloy Compositions.** G. Goddard. *Magnesium Review,* v. 4, April '44, pp. 35-44.
Magnesium base alloys; wrought and cast alloys; composition and properties of magnesium base cast and wrought alloys in use in Great Britain and in the United States.

23-280. **Low Cost Tools.** *Steel,* v. 115, Oct. 2, '44, p. 80.
Built without elaborate designs and drawings, yet require little testing.

23-281. **Light Weight Tanks.** *Steel,* v. 115, Oct. 2, '44, pp. 82, 85.
Drawn from long terne sheets and joined by torch, spot and continuous seam resistance welding. Special jigs and fixtures aid production.

23-282. **Automobile Castings.** *Automobile Engineer,* v. 34, Sept. '44, pp. 352-359.
The Company's latest plant for the large-scale production of cylinder blocks, cylinder heads and brake drums.

23-283. **National Emergency Steels.** *Steel,* v. 115, Oct. 9, '44, pp. 166, 168, 170.
Lean alloy types are here to stay with 68.3% of metalworking plants likely to use them after the war. High alloy steels remain in favorable position with use indicated by 92.2%.

23-284. **Castings, Stampings, Forgings and Die Castings.** *Steel,* v. 115, Oct. 9, '44, pp. 172-173, 176, 178.
Stampings expected to show largest percentage gains in post-war product designs, although substantial increases also are indicated for other types of fabrications. Castings find most widespread usage.

23-285. **Buick Builds "Hellcats" Which Are Formed of a Wide Variety of Parts.** *Steel Processing,* v. 30, Oct. '44, pp. 648-651.
Final form is a 19-ton, high-speed, heavy fire power, armored vehicle representing the latest tactical use of supermobilized artillery.

23-286. **Jessop's Stainless-Clad Steel Economical for Many Purposes.** W. M. Crouch. *Steel Processing,* v. 30, Oct. '44, pp. 652-655.
Uses and advantages.

23-287. **Veterans Return!** R. A. Road. *Die Casting,* v. 2, Oct. '44, pp. 30-31.
Simplicity of pieces, and reduction of assembly time are important reasons for the return to the use of die castings after experience with steel fabrication.

23-288. **Again and Again Die Castings Show Their Worth.** D. P. Hoover. *Die Casting,* v. 2, Oct. '44, pp. 35-36, 68.
The dynamic strength of the die castings in dupli-

cating machines—which take more than 3600 thrusts per hour—should not be overlooked by the designer.

23-289. **Advantages and Specifications of Fine-Pitch Gears.** *Product Engineering,* v. 15, Oct. '44, pp. 697-701.

Gears having 30 diametral pitch and finer, and employing the involute tooth form are discussed. Recent developments in gear cutters, shavers, and inspection tools for manufacturing fine-pitch gears are reviewed. Common errors in the design of such gears are pointed out.

23-290. **The Production of Helmets at McCord Manufacturing Co.** *Modern Industrial Press,* v. 6, Oct. '44, pp. 22, 24, 46.

Center of the operation in the manufacture of steel helmets is a 500-ton mechanical press which transforms a wafer of exceptionally hard manganese steel into a battle helmet in a matter of seconds. A 7-in. draw is made successfully by almost completing the press cycle on the first strike and allowing a slight pause to permit the metal to assume its outline in the rough and then completing the press cycle. This slight pause permits completing the process without fracturing the metal.

23-291. **Building LCM-3 Invasion Barges for the U. S. Navy.** Raymond J. Fitness. *Modern Industrial Press,* v. 6, Oct. '44, pp. 30-31, 46.

Equipment and processes.

23-292. **The Manufacture of the Ameri-can.** *Machinery* (London), v. 65, Sept. 21, '44, pp. 309-318.

Flow methods in the production of an improved petrol container.

23-293. **Experience in War Production Points to the Future of Die-Castings in Peacetime.** R. L. Wilcox. *Machinery,* v. 51, Oct. '44, pp. 160-161.

Because of efficient use of materials, machines, and labor, die casting method of fabrication will undoubtedly be used to a greater extent than ever in the manufacture of consumer goods in the post-war civilian economy.

23-294. **Roll Neck Bearings.** L. R. Underwood. *Engineers' Digest,* v. 1, Sept. '44, pp. 582-583.

Lignofol and Lignostone bearings; bearings composed of wood and synthetic resin; manufacture and properties of Lignofol; manufacture and properties of Lignostone; design, installation and operation.

23-295. **Cadillac Concentrates over 1500 Production Machines.** Joseph Geschelin. *Automotive Industries,* v. 91, Oct. 1, '44, pp. 24-30, 54.

Cadillac has extended the scope of aircraft parts production to a large group of major parts and complete assemblies. Among the most accurately finished parts are the supercharger rotor vanes, which are balanced to 0.004 oz.; and bearing cages, where the total variation in hole size, after pressing into the case, is held to 0.0005 in.

23-296. **Gyropilots in Quantity Production at Auto-Lite.** Joseph Geschelin. *Automotive Industries,* v. 91, Oct. '44, pp. 38-40, 62.

Precision is the key to the operation—precision in manufacturing, great care in assembly, unusual precautions as to cleanliness. Most bores and ground diameters are held to 0.0002 and 0.0003 in.

23-297. **Manufacture of the Vickers Self-Aligning Bearing.** *Machinery* (London), v. 65, Sept. 7, '44, pp. 257-259.

Eliminates the necessity for the ball bearings formerly employed for connecting articulating levers and similar parts.

23-298. **Malleable Cast Iron, IV.** J. A. Wylde. *Metallurgia,* v. 30, Sept. '44, pp. 245-248.

Makes comparisons with competitive materials, with a view to facilitating the choice of the designer or production engineer, and refers to some of the more important applications of malleable iron castings.

23-299. **Metallurgical Data on German Engines.** *Aircraft Engineering,* v. 16, Sept. '44, pp. 248-252.

Light alloy pistons. II. Light alloy cylinder heads. Description of samples; chemical composition; mechanical properties; hardness tests; macrostructure; microstructure.

23-300. **Aluminum and Magnesium in the Electrical Industries.** B. J. Brajnikoff. *Light Metals,* v. 7, Oct. '44, pp. 471-479.

Aluminum production at Alcoa plants and at Arvida, and the electrical equipment associated with it. 4 ref.

23-301. **Aluminum in the Chemical Industries.** *Light Metals,* v. 7, Oct. '44, pp. 483-496.

23-302. **Light Alloys in Metal Rectifiers and Photocells.** *Light Metals,* v. 7, Oct. '44, pp. 505-512.

Copper oxide and caesium types of photocells.

23-303. **Stud Link Anchor Chain.** *Canadian Metals & Metallurgical Industries,* v. 7, Oct. '44, pp. 38-39.

Welded 2 1/16-in. chain for merchant ships.

23-304. **New Aluminum Alloys and Processes.** Hiram Brown. *Aluminum & Magnesium,* v. 1, Oct. '44, pp. 24-27, 39.

The development of alloys on the aluminum-zinc-magnesium base. Uses of these new alloys have included sand, plaster, and centrifugal casting, rolled sheet, and other wrought and extruded products. 3 ref.

23-305. **Tips on Self-Lubricating Bearings.** *Aero Digest,* v. 47, Oct. 15, '44, pp. 116, 152.

Manufacturing technique; avantages.

23-306. **Postwar Outlook for Castings.** *Foundry,* v. 72, Nov. '44, pp. 92-93, 194, 196.

A study of expected choice of materials in postwar product design indicates sustained or increased use of castings by most consumers. Preferences vary in different industries and according to size of plant.

23-307. **Metlbond—A Metal Adhesive for Aircraft.** G. G. Havens. *Mechanical Engineering,* v. 66, Nov. '44, pp. 713-714, 736.

Development of metal adhesives; theory of adhesion; Metlbond combines several adhesives; special applications.

23-308. **Gage Devised for Counting Commutator Bars.** J. I. Karash. *American Machinist,* v. 88, Nov. 9, pp. 94-95.

Simple device is made of a tube ring with gaging teeth cut on each end. Method for counting bars is fast and more accurate.

23-309. **Thermit Branches Out.** Kenneth Rose. *Scientific American,* v. 171, Nov. '44, pp. 199-201.

Intense heat (above 4500° F.) is generated by reaction of granular metals when correctly ignited. The heat alone can be applied to many uses, or the resulting metallic mass can be used for construction or repair purposes. Major trends are now in view.

23-310. **Blade Fabrication.** *Tool Engineer,* v. 14, Nov. '44, pp. 77-83.

Establishing centers in forging; visual inspection of contours; hand grinding for finish; brazing the propeller blade; sealing the blade.

23-311. **60,000,000 Die Castings Can't Be Wrong.** H. E. Musselman. *Die Casting,* v. 2, Nov. '44, pp. 24-25, 60.

Die castings have more than shape. They have dynamic qualities that are often overlooked by the busy engineer who has not had the opportunity to discover their structural advantages. Die castings in precision lathes.

23-312. **Fire Bombs—an Old Weapon Brought Up to Date.** S. E. Whitesides, Jr. *Die Casting,* v. 2, Nov. '44, pp. 30-31.

The advantages of die casting as a means of rapidly producing great quantities of duplicate precision parts.

23-313. **Where Die Castings Are a Life and Death Matter.** J. A. Smeller. *Die Casting,* v. 2, Nov. '44, pp. 32-35.

Oxygen regulators that guard the breathing apparatus for airplane crews must be absolutely leak-proof at pressures of 50 psi. Tests also include corrosion, vibration, temperature checks.

23-314. **Die Castings for Cool Heads.** Fred M. Burt. *Die Casting,* v. 2, Nov. '44, pp. 36-37, 60.

The die casting of parts for oil cooling systems.

23-315. **Notes on Synthetic Rubber and the Necessary Equipment.** Myron Weiss. *Metal Progress,* v. 46, Nov. '44, pp. 1091-1096.

Brief account of a war effort that would be impossible without a generous supply of proper metals for the manufacturing equipment.

23-316. **The Production of the Merlin Engine.** *Machinery* (London) v. 65, Oct. 19, '44, pp. 421-427.

Rolls-Royce methods at a Ministry of Aircraft Production Factory.

23-317. **Steel Castings in Aircraft.** J. F. B. Jackson. *Aircraft Production,* v. 6, no. 67, May '44, pp. 207-209. *Engineers' Digest,* v. 1, Oct. '44, pp. 614-615.

Designing; properties.

23-318. **Piston Ring and Cylinder Wear in Automobile Type Engines.** P. V. Lamarque. Report No. 1942/10, Automobile Research Committee, The Institution of Automobile Engineers. *Engineers' Digest,* v. 1, Oct. '44, p. 630.

Cylinder wear and related problem of oil consumption.

23-319. **Metallurgical Warfare.** G. L. Cox. *Army Ordnance,* v. 27, Nov.-Dec. '44, pp. 478-480.

Production of high quality steel for ordnance materiel.

23-320. **Accurate Blanks Necessary to Produce Fine-Pitch Spur Gears.** Charles Bullen. *American Machinist,* v. 88, Nov. 23, '44, pp. 105-106.

Checking some seemingly obvious points in blanks and gears can prevent much waste of time and material spent in assembling intricate types of equipment.

23-321. **Mill Bearings.** H. L. Smith. *Iron & Steel,* v. 17, Nov. '44, pp. 680-681.

Use of lead-base babbitts containing arsenic.

23-322. **Light Alloys in Metal Rectifiers and Photocells.** *Light Metals,* v. 7, Nov. '44, pp. 525-529.

Apparatus, auxiliary materials and technique employed in preparing and handling alkali metals for photocells. Physical and chemical properties of these metals and methods for their extraction.

23-323. **The Lightness Factor in Post-War Road Transport.** *Light Metals,* v. 7, Nov. '44, pp. 530-536.

Economic and technical advantages of aluminum construction for commercial vehicles.

23-324. **Aluminum in the Chemical Industry.** *Light Metals,* v. 7, Nov. '44, pp. 537-551.

Application of light metals for specific purposes in chemical engineering. Suitability in plant for the production of various types of compound.

23-325. **Vulcanizing Rubber with Magnesium.** Wilfred Griffin. *Light Metal Age,* v. 2, Nov. '44, p. 29.

Powdered magnesium heating element. Primarily for use of magnesium in pelleted form in a tablet to vulcanize rubber inner tubes.

23-326. **Novel Method of Handling Bombs Increases Efficiency.** Alan B. Salkeld. *Steel Processing,* v. 30, Nov. '44, pp. 707-711.

Nose and tail forged by "wobblers"; flat drills used on bomb noses; stresses relieved; descaling, cleaning, painting.

23-327. **Civilian Requirements for Metals Receive Greater Consideration in Great Britain.** L. H. Tarring. *Metals,* v. 15, Nov. '44, pp. 16-17.

Metals needed for repair of buildings given high priority; no serious displacement of tin by substitutes anticipated.

23-328. **Industrial Applications of the Rare Earth Metals.** R. C. Vickery. *Metallurgia,* v. 30, Oct. '44, pp. 311-312.

Uses to which rare earth metals have been put either individually, as a group, or in their naturally occurring forms.

23-329. **National Emergency Steels for Heavy Naval Forgings.** William C. Stewart and Richard E. Wiley. *Metal Progress,* v. 46, Dec. '44, pp. 1258-1262.

Tests made on 12 steels of five NE grades, furnished in the form of 8-in. rounds, which indicate that NE

8630, 8740, 8745, and 9445 will meet requirements of the Navy's Class An for propulsion shafting and pinion gears, when normalized and properly tempered. NE 8745 can meet the more difficult requirements of Class HG.

23-330. **Metals for the Railroads.** *Railway Mechanical Engineer*, v. 118, Dec. '44, pp. 558-561, 563.

Study of metals a constant one for railroad engineers and designers—laboratory, shop and service findings all important. Railroad axles, by O. J. Horger; Metal limitations in the perfecting of motive power, by Paul Irwin; Incipient cracking in firebox and boiler steel, by Ray McBrian; Improving the railroad car bearing, by J. R. Jackson.

23-331. **Box Car Has Aluminum Sheathing.** *Railway Age*, v. 117, Dec. 9, '44, pp. 879-880, 887.

Great Northern's 50-ton steel-frame plywood-lined car utilized all-aluminum exterior to reduce the weight by 4057 lb.

23-332. **Uses of Tool Steel Tubing.** George Bissett. *Tool Engineer*, v. 14, Dec. '44, pp. 89-92.

Man-hours, machine time, and materials may be saved by substituting tubing for bar stock where rings or rolls are required in machine and tool engineering. Typically ingenious tooling applications are described.

23-333. **Unification of Bearings.** H. Tornebohm. *Steel*, v. 115, Dec. 11, '44, pp. 142, 144.

Standardization of boundary dimensions reduces number of styles, bringing new economies in production and maintenance. International classifications permit the immediate inclusion of new types of bearings.

23-334. **Tooling for Hydraulic Valve Production.** Gerald Eldridge Stedman. *Machine Tool Blue Book*, v. 40, Dec. '44, pp. 139, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160.

The Adel midget series of hydraulic selector valves.

23-335. **Coated Abrasive Belts Make War History.** Thomas Trowbridge. *Machine Tool Blue Book*, v. 40, Dec. '44, pp. 67-168, 170, 172, 174, 176, 178, 180, 182.

Use and applications.

23-336. **Ball and Roller Bearings.** L. Rosenfeld. *Automobile Engineer*, v. 34, Nov. '44, pp. 503-505.

Experiments carried out in calibrating the roller bearing friction of an apparatus for testing the friction of a plain bearing.

23-337. **Plastics in Tool, Jig and Fixture Construction.** E. E. Halls. *Plastics*, v. 8, Nov. '44, pp. 530-544.

Work of the Vega Aircraft Corporation. Plastic tools that withstand 8000 psi. under hydraulic presses. Plastic used is a phenolic resin, the filler material is the ordinary walnut shell finely pulverized, and the chief items of chemical plant involved are mixer and oven.

23-338. **No More Chain Gang.** G. W. McCollum. *Die Casting*, v. 2, Dec. '44, pp. 24-25.

Use of die casting makes possible an inexpensive electric hoist; opens new market.

23-339. **Little Power House.** Paul Maurer. *Die Casting,* v. 2, Dec. '44, pp. 29-30.

Postwar uses of die castings in electric motors and appliances.

23-340. **Die Cast Elements Actuate the Clutch.** A. H. Wehmeyer. *Die Casting,* v. 2, Dec. '44, pp. 32-34.

Clutch assembly.

23-341. **Special Applications for Tin Base Die Castings.** H. M. Fraser. *Die Casting,* v. 2, Dec. '44, pp. 41-43.

Tin base metal not an expensive material but several considerations recommend its use.

23-342. **"Know How" Gives Leak Proof Performance.** George E. Ford. *Die Casting,* v. 2, Dec. '44, pp. 46-47.

Use of die castings in producing bomb bay fuel tank gages.

23-343. **Thin Plate Method Speeds Mounting of Ball Bearings.** *American Machinist,* v. 88, Dec. 21, '44, p. 107.

Using Alclad steel plates only slightly thicker than the races, method developed which cuts rejects and makes bearings able to withstand thrust loads of greater amount.

SECTION XXIV

DESIGN

24-1. **Design It Correctly.** Marc Stern. *Die Casting,* v. 2, no. 1, Jan. '44, pp. 13-15, 44.

Specific information on good design practice in various parts of a die casting. Sound principles backed by experience (to be continued).

24-2. **Threading.** R. R. Weddell. *Tool Engineer,* v. 13, no. 1, Jan. '44, p. 71.

Important factors for producing smooth, accurate threads. Design and care of tools, gaging, tool and machine attachments and machine conditions.

24-3. **Calculation of Stiffened Shells in Metal Airplane Design.** E. Schapitz. *Engineers' Digest,* v. 1, no. 2, Jan. '44, pp. 91-95.

1. The features of shell structures. 2. The special strength requirements in airplane design. 3. The problems of stress analysis in metal aircraft design. 4. Stability conditions. 5. Stiffened plates and shells subsequent to buckling of the skin. 6. Elementary calculation of stiffened shells. 7. Diffusion problems.

24-4. **An Approach to Functional Design Standards.** Roger W. Bolz. *Modern Machine Shop,* v. 16, Feb. '44, pp. 178-188.

Functional simplicity and standardization in design, taking into consideration the problem of (1) the amount of machining or processing required, (2) simplicity and economy in tooling for machining operations, (3) ease and economy in assembling, and (4) simplicity of servicing, can thus effectively result in a product having superior design characteristics, closely adapted material requirement and production facilities, and last, but not least, lower total costs.

24-5. **Simplified Method for Designing Beam Sections—II.** William L. Govan. *Product Engineering,* v. 15, no. 2, Feb. '44, pp. 121-123.

Procedure for checking and adjusting the preliminary proportions of beam sections as obtained by the equations developed in Part I, with a summary of the complete method for designing a satisfactory section. Practical design considerations are enumerated which may dictate modifications in final proportions.

24-6. **Designing Single-Plunger Injection Pump.** Raymon Bowers and R. E. Peterson. *Machine Design,* v. 16, no. 2, Feb. '44, pp. 174-176, 238-244.
Description.

24-7. **Hydraulic Cylinder Design.** W. W. C. *Machinery (London),* v. 64, Jan. 13, '44, pp. 44-45.
Design procedure.

24-8. **Design and Application of Phenolic Composition Bearings.** O. K. Graef. *Machinery Lloyd,* v. 16, Jan. 8, '44, pp. 49-53.
Bearing composition; properties and design.

24-9. **Rational Design of Fastenings.** E. S. Jenkins. Preprint. War Engineering Annual Meeting, S.A.E., Detroit, Jan. '44, 14 pp. (mimeo).
Results are of interest with relation to cemented joints and give a quality insight to behavior of discontinuous joints. Tearing stresses are partially responsible for failure of edge fasteners in spotwelded connections. Important in determining fatigue characteristics.

24-10. **Design It Correctly—II.** Marc Stern. *Die Casting,* v. 2, Feb. '44, pp. 15-17.
Good design practice in various parts of a die casting.

24-11. **Truss-Type Fuselage Analysis with Graphical Solutions.** Gail Swan and Richard H. Gade. *Product Engineering,* v. 15, March '44, pp. 185-189.
Application of the graphical method of joint analysis to determine distribution of weights, loads and inertia reactions of external loads in truss-type fuselages. The moment distribution method is applied for evaluating secondary bending effects resulting from deflection or eccentric forces between panel points. Typical solution diagrams are included.

24-12. **Pneumatic Systems and Controls in Mechanical Design.** E. E. Hewitt. *Product Engineering,* v. 15, March '44, pp. 174-177.
Basic systems and accessory valves for the control of force, proportional movement, sequence and timing through the application of air pressure in operational devices. Schematic diagrams of valve and piping arrangements are included. Possibilities inherent in pneumatic control applications are discussed.

24-13. **Small Differences.** W. A. Tuplin. *Machinery* (London), v. 64, Feb. 10, '44, pp. 149-151.
How to determine the value of a quantity that differs only slightly from one of the given quantities. Application to hob design.

24-14. **Machine Structures and Continuous Girders.** W. W. C. *Machinery* (London), v. 64, Feb. 3, '44, pp. 128-129.

24-15. **Frequently Overlooked Factors in Design of Springs.** A. M. Wahl. *Machine Design,* v. 16, no. 3, March '44, pp. 107-111.
Factors involved in design of helical compression springs. These factors include allowance for end turns, effect of eccentricity of loading, variations in modulus of rigidity, effects of cold setting, and stress at solid compression. 8 ref.

24-16. **Redesigning to Utilize Stamping Process. Pt. II.** Colin Carmichael. *Machine Design*, v. 16, no. 3, March '44, pp. 120-123, 180.

Complete redesign of a self-contained machine discussed. Indicating what can be done on a smaller scale, the redesigned pyrotechnic pistol illustrated affords an interesting example. The original pistol, made primarily from machined castings, cost $34 complete with mount. The new design, utilizing steel stampings extensively, cost $11 and weighed 40% less. Much of the saving in cost is due to the adaptability of the stamping process to low-cost mass production.

24-17. **A New Slant on Sheet - Metal Fastenings.** E .S. Jenkins. *Machine Design*, v. 16, no. 3, March '44, pp. 131-136, 160.

Existing roles contradicted; load distribution affected by stiffness; measuring the deformations; rivet and spotweld stiffness compared; rivet loads more uniformly distributed; continuous joints precisely analyzed, comparing induced stresses; high stresses found in cement and importance of tear-stresses.

24-18. **Built-up Design Cuts Costs 20%.** G. W. Birdsall. *Steel*, v. 114, March 20, '44, pp. 88-90, 92.

Ingenious use of tubing with formed, sized and welded plate has many production advantages, reduces cost more than 20%. This type of design with its wide range of application is believed to have considerable postwar significance.

24-19. **Tubular Assembly Fixtures.** *Aircraft Production*, v. 6, March '44, pp. 149-150.

Notes on an American trend in the design of production equipment.

24-20. **Redesigned Bearing Separators Save Weight, Critical Materials, Manhours.** *Product Engineering*, v. 15, April '44, pp.237-240.

Important savings made in gun mount separators through redesign. Stamped steel replaced by cast bronze.

24-21. **High Performance Fighters.** Kurt Tank. *Automotive Industries*, v. 90, April 1, '44, pp. 22-23, 56, 58.

Design problems at stratospheric altitudes discussed in article by German aeronautical engineer and designer of Fockewulf FW 190 fighter.

24-22. **Design for Finishing.** G. C. Close. *Industrial Finishing*, v. 20, March '44, pp. 68, 70, 72, 74, 78, 80.

Plea for closer cooperation between design engineers and finish engineers. There is more to correct design than mechanical perfection and the ability to withstand certain precalculated stress loads. Any part, no matter how mechanically perfect, will maintain such perfection only as long as the material from which it is fabricated maintains its original physical and chemical characteristics.

24-23. **High-Pressure Pipe-Line Research.** F. W. Laverty and F. M. McNall. American Society of Mechanical Engineers *Transactions*, v. 66, April '44, pp. 215-219.

Derivation of an empirical equation containing all of the design variables, to which the methods of the dif-

ferential calculus may be applied to yield a general series of expressions for the most economical design of any pipe line. 7 ref.

24-24. **Designing Tool Equipment to Facilitate Production by Contracting Tool Rooms.** E. Boneham. *Machinery,* (London) v. 64, March 23, '44, pp. 315-317.

Delays often due to print being illegible, poor drawing equipment, dimensions in metric measure.

24-25. **Theory and Experiment Applied to Journal Bearing Design.** H. W. Swift. *Engineers' Digest*, v. 1, April '44, pp. 294-295.

Essential data required are the relationships connecting film thickness and friction with the constructional and impressed conditions.

24-26. **Design Rules, III.** Herbert Chase. *Die Casting,* v. 2, May '44, pp. 40-45.

Hold over-all dimensions to the minimum; avoid needlessly complex pieces; minimize flash removal costs.

24-27. **Cemented Assemblies—Their Place in Design.** John Delmonte. *Machine Design,* v. 16, May '44, pp. 79-82.

Cemented assemblies vs. riveted or welded construction. Saves parts and weight; cuts costs; high-frequency heating may be used.

24-28. **Curtailing Thermal Expansion in Design.** Frederick C. Victory. *Machine Design,* v. 16, May '44, pp. 109-110.

Three possible solutions to this indirect result of thermal expansion.

24-29. **Design Rules—IV.** Herbert Chase. *Die Casting,* v. 2, June '44, pp. 31-32, 34.

Keep sections as thin as possible; maintain uniform thickness of sections; if section thickness must vary, make transitions gradual.

24-30. **The Design of Stampings for Low Frequency Transformers.** R. Mawson. *Electronic Engineering,* v. 16, May '44, pp. 514-516.

After obtaining an expression by which the relative merits of stamping shapes may be compared, this formula is used in the following ways: To determine the optimum core area and position of the core; to determine the optimum stamping when one dimension is fixed; to determine the optimum shape of the stamping for a given area. A second formula is used to determine the shape of the stamping giving the maximum inductance for a given wire size.

24-31. **How End-Coil Design Affects Tension Springs.** A. M. Wahl. *Machine Design,* v. 16, July '44, pp. 107-112.

Stresses in end coils as well as initial tension and working stress. Design in tension springs. 10 ref.

24-32. **Thrust Bearing Design by Sleeve Bearing Analogy.** H. W. Hamm. *Product Engineering,* v. 15, July '44, pp. 437-440.

Determination of allowable bearing pressure, the coefficient of friction and the slipper angle for inclined slipper bearings by a method based on the hydro-

dynamic theory for sleeve bearings. Conversely, application of slipper bearing design principles to sleeve bearings indicates that allowable sleeve bearing pressures are high for slow-speed shafts.

24-33. **Spring-Supported Mountings for Vibration Isolation.** Merhyle F. Spotts. *Product Engineering,* v. 15, July '44, pp. 441-443.

How the general equation for forced vibration without damping can be expressed in convenient forms for use in reducing the forces and motions of vibrating machinery. Curves included for the graphical solution of the equation for any desired percentage of isolation.

24-34. **Tool Engineers Refine Set-Ups for M-53 Fuze Components.** *American Machinist,* v. 88, July 20, '44, pp. 119-128.

Tooling layouts for body, head, housing delay, slider plug, safety pin, and locking pin.

24-35. **Practical Points in Machine Design.** A Shop Foreman. *Machinery* (London), v. 64, June 1, '44, pp. 598-599.

The prime consideration in design should be simplicity. Data for taper calculations.

24-36. **Practical Application of Shop Mathematics.** C. W. Hinman. *Steel Processing,* v. 30, July '44, pp. 432-435.

Covers a large assignment of the formulas used in designing tools and machines for processing metals and should be particularly helpful to the beginners in tool and machine designing.

24-37. **The Use of Lateral Stiffeners.** E. H. Windolph. *Iron & Steel Engineer,* v. 21, July '44, pp. 54-58.

Design and use of box girders.

24-38. **Photographs Aid Presentation of Design Details.** John W. Greve. *Machine Design,* v. 16, August '44, pp. 97-100.

Possibilities for use of photographs in the engineering department to conserve drafting and assembly time.

24-39. **Direct Method Facilitates Helical Spring Design.** R. G. Minarik. *Machine Design,* v. 16, August '44, pp. 145-148.

Design procedure.

24-40. **Handsome Is as Handsome Does.** Robert S. Schwachter. *Die Casting,* v. 2, August '44, pp. 68, 70, 72.

Diamond tool design.

24-41. **Wooden Models Aid in Selection of Special Production Machines.** C. A. Salmonsen. *American Machinist,* v. 88, August 31, '44, p. 101.

Use of wooden models to test the operations being planned make possible marked improvements in machine design. Suggested changes can be incorporated in the model immediately.

24-42. **Design Rules—VII.** Herbert Chase. *Die Casting,* v. 2, Sept. '44, pp. 45-51.

Fillets should be used at all inside corners (often at outside corners). Attain simplest shapes, avoid unnecessary projections. Unless machining is to be done, dimensional limits should be as great as possible.

24-43. **Sheet-Metal Pattern Development.** W. Cookson. *Engineering,* v. 158, July 14, '44, pp. 37-39.

Geometrical pattern drafting, in which the specified shape and size of the job, as set out on a working drawing, can be translated into a surface development on the flat metal sheet. Mathematical development.

24-44. **Design for Arc Welding.** T. B. Jefferson. *Welding Engineer,* v. 29, Sept. '44, pp. 35-37.

Building; modern trend; appearance; a multi-piece design; tension base; support base and top; from war to peace; what designers must consider.

24-45. **Machine Welding in the Fabricating Shop.** John Lippart and S. H. Hemenway. *Machine Tool Blue Book,* v. 40, Sept. '44, pp. 215-216, 220, 222.

Comparison of cast and fabricated design problems.

24-46. **Welded Structures vs. Meehanite Castings.** Edward J. Charlton. *Iron Age,* v. 154, Sept. 21, '44, pp. 74-77, 168, 170-173.

Design and physical characteristics of diesel engine frames and other "heavy" machinery made of welded steel plate, as compared with similar structures made of Meehanite castings.

24-47. **Yield Strength—Vital in Aluminum Design.** Hiram Brown. *Light Metal Age,* v. 2, Sept. '44, pp. 24-27.

Aluminum alloys have been unduly penalized and limited by design specifications which have been based upon ultimate tensile strength rather than upon tension yield strength. Shows why tension yield strength is the most reliable factor; shows specifically where yield strength can be put to work as a reliable indicator of proper chemical composition and heat treatment.

24-48. **Designing Tools to Meet Labor Shortage.** J. S. Haldeman. *Machinery,* v. 51, Sept. '44, pp. 147-157.

Tools and methods designed to counteract labor shortages.

24-49. **The Production of Aircraft Stampings.** J. A. Oates. *Aircraft Production,* v. 6, Sept. '44, pp. 413-424.

Layout of a typical High Duty Alloy Ltd. factory; crankcase production; furnace design.

24-50. **Stainless Steel Stampings for Ship Parts.** W. J. Meinal. *Metals & Alloys,* v. 20, Sept. '44, pp. 616-619.

Application of a modern structural and corrosion resisting materials — stainless steel — and a modern metal-form—stampings—to the design and construction of important ship components with outstanding production speed, cost, and engineering advantages.

24-51. **Outstanding Designs.** *Machine Design,* v. 16, Oct. '44, pp. 104-107.

Magnifying comparator; electronic oscillograph; electronic power generator; automatic plastics molding press.

24-52. **New Horizons in Product Design.** Edward F. Flint. *Die Casting,* v. 2, Oct. '44, pp. 26-28, 64-67.

The design problem involved the combination of five elements which are separate instruments in themselves. These, besides having to perform satisfactorily individually, had to be combined into a compact light-

weight instrument. Die casting permitted the consolidation of many separate parts into single castings.

24-53. **Approximate Calculations for Helical Springs of Round Section.** G. Ashworth. *Machinery* (London) v. 65, Sept. 14, '44, pp. 299-300.

Formulae which will give an immediate and close approximation to the final design when the ratio of the diameter of the spring rod to the diameter of the spring is within normal limits.

24-54. **Factors in Machine Base Design.** F. L. Lindemuth. *Industry and Welding,* v. 17, Oct. '44, pp. 66, 68-69, 71-73.

Fabrication details of great importance.

24-55. **Redesign Bearing Separators to Lighten Weight of Navy Equipment.** S. R. Thomas. *Steel,* v. 115, Oct. 30, '44, pp. 78, 80.

Channel-shaped, rolled steel bearing retainer rings and gun-mount bearing separators of alternate material effectively reduce overall ship weights to permit heavier armor plating.

24-56. **Designing Aluminum Sand Castings.** R. Irmann. *Light Metal Age,* v. 2, Oct. '44, pp. 18-22.

Pictorial outline of right and wrong fundamental designs.

24-57. **Rigidized Sheet Metal Lightens Panel Design.** Dimitry E. Olshevsky. *Product Engineering,* v. 15, Nov. '44, pp. 741-744.

Development of a method for substantially increasing flexural strip rigidity of sheet metal in all directions by impressing carefully designed patterns of beads and ridges offers a new approach to weight reduction of panel structures.

24-58. **Design Rules—IX.** Herbert Chase. *Die Casting,* v. 2, Nov. '44, pp. 38-41.

Take advantage of cast threads. Design toothed or irregular shaped contours for die casting rather than machining.

24-59. **Stampings in Present Day Aircraft Production.** Ernest C. Morse. *Steel Processing,* v. 30, Nov. '44, pp. 712-713.

Advent of airplane mass production; savings in cost and materials; redesigning for press reduction; recognition of results from stampings.

24-60. **What a Designer Needs in Your Catalog.** E. A. Pinger. *Western Metals,* v. 2, Nov. '44, pp. 74, 76-78.

Designer looking for information to place on his drawing needs definite measurements and specifications, wants fundamentals pertinent to his need, such as dimensions and tolerances, materials and heat treat conditions, finish, definite part number, approval by government services, specifications.

24-61. **Designing Aluminum Forgings.** Stanley V. Malcuit. *Metals and Alloys,* v. 20, Nov. '44, pp. 1319-1326.

Principles of aluminum forging design and various design-detail recommendations for achieving highest quality aluminum forgings and for simplifying their production.

24-62. **Better Quality Aluminum and Magnesium Castings for Aircraft.** Robert E. Ward. American Foundrymen's Association *Transactions,* v. 52, Dec. '44, pp. 475-482.

Necessity of producing light metal aircraft castings of the quality and in the quantity demanded by the present emergency. Close coordination of the work of designers, engineers and foundrymen is given as the fundamental essential in high quality casting production. Principles of casting design.

24-63. **New Machine and Tool Design Speeds Aircraft Parts Output.** Gerald Eldridge Stedman. *Tool Engineer,* v. 14, Dec. '44, pp. 73-76.

From tool grinding to tube bending, fighting plane builder meets rising production schedules with manufacturing methods which require a minimum of space and skilled man-hours.

24-64. **Design Considerations for Square or Rectangular Wire Helical Springs.** A. M. Wahl. *Wire and Wire Products,* v. 19; Dec. '44, pp. 842-843.

Considerations involved in the design of helical tension or compression springs made of square or rectangular wire, with particular reference to the effect of curvature on stress and deflection.

24-65. **Thought for Fuel.** L. B. Harrington. *Die Casting,* v. 2, Dec. '44, pp. 22-23, 44-45.

Refinement in a die cast electric fuel pump. The engineers, profiting by the advantages of die casting in their previous models, make it do double duty in their designs for a heavier unit.

24-66. **A Simplified Solution to a Production Problem.** *Die Casting,* v. 2, Dec. '44, pp. 48-49.

Die vs. sand casting gun turret valves.

24-67. **Designing Aluminum Alloy Forgings.** L. W. Davis. *Machine Design,* v. 16, Dec. '44, pp. 111-116.

Limitations and possibilities of product.

SECTION XXV

MISCELLANEOUS

25-1. **Metallurgical Department of Small Arms, Ltd.** W. S. Craig. *Canadian Metals & Metallurgical Industries,* v. 6, no. 12, Dec. '43, pp. 20-23.

Modern organization and equipment aid production.

25-2. **Production Control—a Method of Approach.** William F. Walker. *Machinery* (London), v. 63, no. 1622, Nov. 11, '43, pp. 548-552.

Detailed outline of a suggested works production meeting to achieve more economical production methods.

25-3. **Training Spurs Production at Rock Island Arsenal.** Waldo C. Wright. *Modern Machine Shop,* v. 16, no. 8, Jan. '44, pp. 140-156.

Fitting inexperienced men to war jobs in a government plant by apprenticeships, in training service and incidental assignments.

25-4. **Building "Liberators."** C. W. Greaves. *Modern Machine Shop,* v. 16, no. 8, Jan. '44, pp. 124-136.

Outline of mass production methods in use at the San Diego plant of Consolidated Vultee Aircraft Corp.

25-5. **Fixture Aids Marine Crankshaft Assembly.** *American Machinist,* v. 87, no. 26, Dec. 23, '43, pp. 88-89.

Assembly of 16-ton crankshaft in Liberty ship at Joshua Hendy Iron Works.

25-6. **Enemy Weapons Show Effect of Critical Material Shortages.** John Haydock. *American Machinist,* v. 88, no. 1, Jan. 6, '44, pp. 115-116.

The Foreign Materiel Division, at Aberdeen, tears down and carefully inspects captured enemy weapons; the outstanding finding is that poor quality, and often poor design, is certain to accelerate defeat of the Reich.

25-7. **Self-Diffusion in Minerals, Particularly Copper Sulphides.** A. M. Gaudin and Kenneth C. Vincent. *Mining Technology,* v. 8, no. 1, Jan. '44, Tech. Pub. 1663, 6 pages.

Experimental technique and results. There was no acquisition of radioactivity by sphalerite from radioactive Zn in solution, or from chalcocite. There was considerable acquisition of radioactivity when chalcocite was in contact with radioactive Cu in aqueous solution. 10 ref.

25-8. **Special Devices Used in Aircraft Work.** *Machinery* (London), v. 63, no. 1625, Dec. 2, '43, pp. 625-626.

Description of simple devices for holding heavy work pieces and speeding damping processes which have been developed in the North American Aviation plant.

25-9. **Stack to the Ceiling.** W. J. Kennedy. *Steel,* v. 114, no. 3, Jan. 17, '44, pp. 94, 122.

One plant enlarged its storage space 400% by use of special stacking machine.

25-10. **Rivet Waste.** *Steel,* v. 114, no. 2, Jan. 10, '44, p. 84.

Waste prevented by device that facilitates placing rivets in structure.

25-11. **Conditioning of Greaseless Abrasive Compounds at —20°.** F. H. Seman Payne. *Metal Finishing,* v. 34, no. 1, Jan. '44, pp. 10-11.

By conditioning is meant storing the compounds in a —20° F. atmosphere until they have attained this temperature throughout. This effects a savings of 37%.

25-12. **Lubrication.** *Automobile Engineer,* v. 33, no. 444, Dec. '43, pp. 523-527.

Hydrodynamic action, surface finish, oiliness, anti-seizure additives, bearing surfaces, lubrication effects, loading, atomic seizure, choice of lubricants, mineral oils.

25-13. **Calculating Beam Deflections.** C. L. Brown. *Machine Design,* v. 16, no. 1, Jan. '44, pp. 124-126.

Reliable results obtained with considerable savings of time and effort for beam and shaft deflections.

25-14. **Electrical Installation of the Kaiser Steel Mills at Fontana.** George Scheer. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 96-100.

Description of the electrical installations at the plant and how they are used.

25-15. **Ordering Raw Materials for the Stamping Shop.** C. W. Hinman. *Steel Processing,* v. 29, no. 12, Dec. '43, pp. 632-634.

Time saving system.

25-16. **Post-War Aviation—Part 2.** *Aeronautical Engineering Review,* v. 3, no. 1, Jan. '44, pp. 21-32, 37-41.

A selective bibliography on peacetime plans and problems.

25-17. **Scientific Marking of Aircraft Parts Aids Quality Control.** C. A. Banze. *Aero Digest,* v. 44, no. 2, Jan. 15, '44, pp. 118-120, 217.

Stamping of all parts with individual inspectors' and manufacturers' marks places responsibility for faulty work.

25-18. **Carbon Dioxide Fire Protection in the Steel Industry.** C. A. Getz. *Iron & Steel Engineer,* v. 21, no. 1, Jan. '44, pp. 75-78.

The application of carbon dioxide for fire protection. Outline of a number of steel plant installations.

25-19. **Remember the Past and Look to the Future.** F. C. Lea. *Engineers' Digest,* v. 1, no. 2, Jan. '44, pp. 81-82.

1. Study of mechanics of fluids, leading to theory of similarity and the use of models. 2. Development in

engineering materials. 3. Non-destructive tests of materials. 4. Production of alloys electrically. 5. Position of mechanical engineering as a scientific profession.

25-20. **Low Temperature Grease Research.** *Lubrication,* v. 30, no. 1, Jan. '44, pp. 1-8.

The lubricants which have been developed to enable military aircraft bearings to meet low temperature requirements so dependably, still will be greatly in demand after wartime restrictions are lifted. The pre-war problem was sluggish bearings; if temperatures much below zero, solution will be the lubricants which the petroleum industry has developed for aviation to insure free rolling motion at temperatures approaching—100° F.

25-21. **Mining Geology.** H. J. Fraser. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 55-56.

Geologists have been kept busy on search for strategic mineral deposits for immediate development.

25-22. **Reclamation of Cutting Oil.** Adam T. Krol. *Iron Age,* v. 153, no. 5, Feb. 3, '44, pp. 59-61.

Reclaimed by centrifuging, settling, filtering or by a combination of any one of these methods and subsequently made ready for service after concentrates and disinfectants have been added.

25-23. **Projection Methods for Reproducing Templates.** Thomas Miles. *Product Engineering,* v. 15, no. 2, Feb. '44, pp. 130-133.

When and where to use methods involving cameras for reproducing templates are discussed in this second article of a series. Featured in this installment is a description of a vertical precision camera designed and built by the author.

25-24. **Insure Long Tool Life by Correct Handling.** Harry Crump. *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 140, 176.

Careful handling, storage.

25-25. **How One Plant Cuts Its Costs by Recovering Solvents and Oils.** E. A. Reehl, *Steel,* v. 114, no. 6, Feb. 7, '44, pp. 126-127.

Materials worth 26 cents per gallon are recovered in a metal-working plant at cost of only 5½ cents per gallon; net profit from reclamation is thus 20½ cents per gallon—almost a 400% return on cost of the operation.

25-26. **Characteristics of Plastics as Engineering Materials.** W. F. Bartoe and D S. Frederick. *SAE Journal,* v. 52, no. 2, Feb. '44, pp. 54-61.

Low density, ease of fabrication, low thermal conductivity, available transparency, and low unit cost for mass production items are characteristics of organic plastic materials that make them attractive to the designer and the engineer. Before full use of plastics can be made, however, it is necessary for both the designer and the engineer to have an extensive practical tabulation of their chemical and physical characteristics. Today's cut-and-try methods used with plastics must give way to theoretical design considerations. The authors of this paper have outlined those

things that should be considered in every application with plastics, illustrating their point with pertinent data on the thermoplastic resin known as Plexiglas.

25-27. **Progress in Engineering Knowledge During 1943.** P. L. Alger and James Stokeley. *General Electric Review*, v. 47, no. 2, Feb. '44, pp. 9-13, 17, 29, 33, 42.

Surface chemistry, plastics and elastomers, phosphorus metallurgy, electron microscopy, conservation, standardization, quality control, welding, mechanical engineering, turbines, transformers, switchgear, synchronous machines, direct-current machines, control, aircraft equipment, appliances, radio, X-rays, television, measurement, power systems and transmission, lightning, capacitors, cables, power distribution, overcurrent protection, relaying, carrier current, industrial power, rectifiers, air conditioning, lighting. 47 ref.

25-28. **Broken Drills Removed with Dynamite**, *Iron Age*, v. 153, no. 6, Feb. 10, '44, p. 73.

Salvage procedure for removing broken drills from oil holes of precision made crankshafts.

25-29. **Conservation in the Ordnance Department of the Army Service Forces.** Thornton Lewis. *Mechanical Engineering*, v. 66, Feb. '44, pp. 119-120.

Saving of critical materials as well as a reduction in machine hours and over-all cost. Some illustrations given are: Replacement of circular steel strips on bombs by laminated impregnated paper bands secured by a light steel strip and mechanical solderless method of crimping windshields on armor piercing shot. Use of plastics to replace critical metals and the use of wood as a metal substitute.

25-30. **Metallic Materials.** H. W. Gillett. *Steel*, v. 114, Feb. 14, '44, pp. 110-119.

Progress can be made when design engineer, metallurgist and testing engineer meet on common ground. Gillett proposes outline for use in selecting material best suited for a given application and discusses relative merits of various types. 26 ref.

25-31. **United States Navy Promotes Standardized Pallet Handling.** C. H. Barker, Jr., and G. W. Birdsall. *Steel*, v. 114, Feb. 21, '44, pp. 78-79.

It increases moving and storing efficiency; enables power fork trucks to lift and carry loads; reduces damage losses during shipment and in storage; will cut manufacturing and distributing costs in postwar era.

25-32. **Engineering a System for "Engineering."** John T. Davidson. *Machine Design*, v. 16, no. 2, Feb. '44, pp. 135-139, 246.

How to organize an automatic system for the effective utilization of inexperienced personnel in the performance of "engineering's" many routine tasks.

25-33. **Formular Aids Calculation of Curve Length.** M. W. Powell. *Machine Design*, v. 16, no. 2, Feb. '44, pp. 181-182.

Accurate determination of curved lengths such as tubing, conduit, airplane wing contours, structural sections, etc., can be effected quickly through use of the

approximate formula presented in this data sheet. The only measurements required are the chord length and the angle between the tangent lines at the two ends of the curve. When applied to a range of circular arcs up to 90° subtended angle the maximum error is less than 0.03%.

25-34. **What's a Good Yardstick for Patentability?** George V. Woodling. *Machine Design,* v. 16, no. 2, Feb. '44, pp. 171-173.

The attempt to create a scale for invention.

25-35. **Plant Maintenance and Rehabilitation — Heavy Equipment.** Arthur B. Eastman. *Industry and Welding,* v. 17, Feb. '44, pp. 60-63, 65-66, 68.

Description of mold designed to increase present plant production at Continental-Diamond Fibre Co.

25-36. **Hull Steel Foundries, Ltd., Equips Service Building With Latest Conveniences.** *Blast Furnace and Steel Plant,* v. 32, Feb. '44, pp. 241, 276-277.

Description of building.

25-37. **Quantity Control.** *Automobile Engineer,* v. 34, no. 445, Jan. '44, pp. 12-14.

Various factors involved.

25-38. **Bomb Manufacture Speeded by Mechanical Handling Methods.** W. V. Casgrain and L. J. Bishop. *American Machinist,* v. 88, no. 4, Feb. 17, '44, pp. 105-116.

Delivered to heating furnaces; forged in three operations; quenched two at a time; bored and tapped at five stations.

25-39. **War Industries May Alter South Africa's Peacetime Economy.** Benjamin W. Corrado. *American Machinist,* v. 88, no. 4, Feb. 17, '44, pp. 88-90.

Its wartime industrialization, helped by American and British tools, provides sound post-war opportunities for South Africa regardless of the gold standard.

25-40. **Metallurgical Developments in Brazil.** *Iron & Steel,* v. 17, no. 5, Jan. '44, pp. 218-219.

A new outlook on industrial relations and new techniques of industrial economy, form a firm foundation for developing Brazil's vast natural resources.

25-41. **Removal of Broken Tools from Machined Parts by the Elox Method.** H. V. Hardening. *Tool & Die Journal,* v. 9, Feb. '44, pp. 83-85.

Description of the Elox disintegrating equipment for removal of broken tools.

25-42. **Procedures in Plastics.** *Tool & Die Journal,* v. 9, Feb. '44, pp. 94-95, 97-99.

Fundamentals of procedures in plastics; advantages and disadvantages.

25-43. **Jet Moulding.** *Tool & Die Journal,* v. 9, Feb. '44, pp. 100-101.

Process for the injection molding of thermosetting (as well as thermoplastic) materials.

25-44. **Accuracy and the Geometry of Precision.** E. Willard Pennington. *Tool & Die Journal,* v. 9, Feb. '44, pp. 102-103.

Precision workmanship, methods, and tools.

25-45. **High Speed Marking and Filling.** *Tool & Die Journal,* v. 9, Feb. '44, p. 109.

Illustrated description of the Acromark No. 9A and 9H marking machines.

25-46. **Organization of the Manufacture of Parts.** D. Tiranti. *Aircraft Engineering,* v. 16, Jan. '44, pp. 21-24.

Detail arrangements necessary for the control and progress of work in the shops.

25-47. **Gravity Conveyor System.** Harvey Sellers. *Steel,* v. 114, Feb. 28, '44, pp. 116, 118, 121.

Materials handling at Ohio Crankshaft Inc.

25-48. **Conveyorized Fixtures.** *Steel,* v. 114, March 6, '44, pp. 120-122, 124.

Eliminate time-consuming practice of repeatedly changing work from jig to jig as fabrication progresses down the line, for wing remains in the same fixture until it is completed.

25-49. **Industrial Training Speeds Rehabilitation.** *American Machinist,* v. 88, March 2, '44, pp. 97-98.

Convalescing service men need activity, exercise and training. Arma Corp. combined these needs and now trains service men while they recuperate.

25-50. **Little Savings Make Big Ones at G.E.'s Fort Wayne Works.** *Modern Industrial Press,* v. 6, Feb. '44, p. 28.

At Fort Wayne works of the General Electric Co. large savings in material, machine hours and man hours and consequent increases in war production, are being achieved by a series of small improvements.

25-51. **Battelle Memorial Institute.** B. D. Thomas. *Mining & Metallurgy,* v. 25, March '44, pp. 163-166.

Fifteen years of continuous expansion has made this commercial research organization pre-eminent in the metallurgical and engineering world.

25-52. **Gettering and Getters.** *Light Metals,* v. 7, Feb. '44, pp. 77-80, 81-94.

Account of the physics and chemistry of reagents, and techniques, for cleaning up high vacua. Survey of the patent literature.

25-53. **Information Exchange.** B. Kaiser. *Aircraft Production,* v. 6, Feb. '44, pp. 68-70.

Effects of specialization: Need for a central bureau of technical information.

25-54. **Small-Scale Assembly.** L. H. Whatley. *Aircraft Production,* v. 6, Feb. '44, pp. 79-84.

An interesting application of quantity-production methods to the assembly of intricate mechanism.

25-55. **Practical Postwar Planning Charts Course for Executives and Engineers.** Paul G. Hoffman. *Industry & Power,* v. 46, March, '44, pp. 70-71, 140.

Although much technical information on reconversion and planning for the postwar period cannot yet be released, the definite steps taken by some pioneering companies indicate procedures industrial organizations can follow to have their departments ready in minimum time.

25-56. **Dow Magnesium's Newest Power Plant Is Rushed to Completion.** H. E. Hollensbe. *Industry & Power,* v. 46, March '44, pp. 57-61.

Two 225,000 lb. per hr. boilers, pulverized coal fired, and two 7500-kva condensing turbine-generators installed and placed in operation in remarkably good time, despite wartime delays, priorities, etc.

25-57. **Practical Application of Automatic Control Equipment.** W. H. Steinkamp. *Industry & Power,* v. 46, March '44, pp. 68-69, 140.

Types of control instruments and the factors—such as control medium, power source reliability, location, and cost—that should be considered in selecting apparatus for a particular job.

25-58. **The Work of the Joint Research Committees.** *Metallurgia,* v. 29, Jan. '44, pp. 149-151.

Joint Committees of the Iron & Steel Institute and the British Iron & Steel Federation, and report to the Iron & Steel Industrial Research Council. A review of their work covering the period 1924-1943.

25-59. **Forecasting Tool and Gage Requirements.** Sergius D. Brootskoos. *Iron Age,* v. 153, March 9, '44, pp. 46-51.

Formulas in which are substituted symbols for figures that should be used to forecast tool purchases.

25-60. **Polythene—a New du Pont Plastic.** *Iron Age,* v. 153, March 9, '44, p. 51.

Plastic manufactured by the polymerization of ethylene.

25-61. **New Polyvinyl Resins Developed.** *Iron Age,* v. 153, March 9, '44, p. 67.

Geon No. 202 and 203 are new vinyl chloride, vinylidene chloride copolymers, different from any of the others previously developed.

25-62. **Injection Moulding and Tools for Plastics.** *Machinery* (London), v. 64, Feb. 10, '44, pp. 157-159.

Injection moulding of thermosetting materials similar to that of pressure die-casting by the cold chamber method.

25-63. **Computations for Cooling by Oil - Hydraulic Means.** H. W. Hamm. *Product Engineering,* **v. 15,** March '44, pp. 151-153.

Design calculation data are given for cooling equipment for hydraulic transmissions, bearings, oil pumps and couplings. Formulas are intended to enable engineers to deal accurately and readily with the more common thermodynamic problems.

25-64. **Wartime Designs.** *Product Engineering,* v. 15, March '44, pp. 160-161.

Radio-frequency gun "spot-glues" wood. Cold-coining reduces cost of parts. High-altitude combustion-type airplane heater.

25-65. **New Plastic Compounds Improve Shock-Resistant Parts.** F. J. Donohue and C. H. Whitlock. *Product Engineering,* v. 15, March '44, pp. 178-181.

Presenting developments in combinations of plastics resins with macerated fabric, cotton-cord, sisal fiber

and wood-pulp fillers for molding materials. The resins used are phenolic and melamine.

25-66. **Properties of Polyethylene Suggest Peacetime Applications.** *Product Engineering*, v. 15, March '44, pp. 202-203.

Properties and characteristics that indicate the usefulness of this newest thermoplastic material for special applications are discussed and several examples of products that can be fabricated from polyethylene are given.

25-67. **Preferred Aeronautical Steel Specifications.** *Steel*, v. 114, March 13, '44, pp. 104, 107-108.

Revised list of aeronautical specifications.

25-68. **Materials Handling Innovations.** *Steel*, v. 114, March 13, '44, pp. 116, 143.

Two recent developments utilized to speed the movement of vital supplies. The "Boone car-plate lifter" is a device which enables the easy transportation, placing and handling of the extremely heavy and cumbersome steel plates used as ramps between freight cars and loading platforms.

25-69. **Sawing Fixture Ups Output 933%.** *Tool Engineer*, v. 13, March '44, p. 76.

Production snag relieved by ingenious, low-cost tooling.

25-70. **Scientific Methods of Distribution.** Fenton B. Turck and William E. Hill. *Mechanical Engineering*, v. 66, March '44, pp. 183-191.

Engineering technique as applied to the marketing of the products of twelve industrial companies.

25-71. **Clean Air in the Shop.** Bartlett West. *Modern Machine Shop*, v. 16, March '44, pp. 190-192, 194, 196, 198, 200.

Efficient device has been developed to keep shop air clear and clean of oil-mist, dust and smoke.

25-72. **Ingenious Mechanical Movements.** Charles F. Smith. *Machinery*, v. 50, no. 7, March '44, pp. 203-204.

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices.

25-73. **Production Control in Aircraft Engine Manufacture.** Paul J. Bastian. *Machinery*, v. 50, no. 7, March '44, pp. 205-208.

Records of progress of work, application of the system to gear production.

25-74. **Fluorspar.** H. T. Mudd. *Mining Congress Journal*, v. 30, Feb. '44, pp. 103, 127.

Metallurgical grade, acid grade.

25-75. **The Jig and Tool Efficiency Engineer.** H. S. *Machinery* (London), v. 64, Feb. 24, '44, p. 203.

Accepts complete responsibility for the efficiency, care and maintenance of all jigs, fixtures and special tools, immediately they are passed by the tool-inspection department. Outline of duties, small or urgent jobs, authority needed.

25-76. **The Hazards of Carbon Monoxide: III.** Frank S. Rossiter. *Industrial Heating,* v. 11, March '44, pp. 388, 390, 392.

Sources of the gas, its effects on the human system when absorbed, methods of resuscitation of gassed individuals, and methods for testing for the presence of CO in the atmosphere.

25-77. **New Plant for Purification of Coke Oven Gas.** *Industrial Heating,* v. 11, March '44, pp. 410, 412, 414.

Ford sulphur extraction plant.

25-78. **Shop Equipment and Small Tools.** *Aircraft Production,* v. 6, March '44, pp. 129-130.

Modern aids to efficient production.

25-79. **Pumps for Carbonization Plants.** *Metallurgia,* v. 29, Feb. '44, p. 180.

A special centrifugal design for use under difficult conditions.

25-80. **British Owned German Patents.** S. T. Madeley. *Metallurgia,* v. 29, Feb. '44, pp. 181-182.

Under present conditions difficulties frequently arise regarding the position of enemy patents which are substantially British owned. The author endeavors to clarify the position and explains that such patent rights granted and pending are not being revoked or permanently taken over by the state.

25-81. **Steel Plant Laboratories.** *Canadian Metals & Metallurgical Industries,* v. 7, March '44, pp. 24-26.

Facilities for chemical and metallurgical control at Atlas Steels, Ltd.

25-82. **Achievements and Post-War Plans.** *Canadian Metals & Metallurgical Industries,* v. 7, March '44, pp. 26-28, 44.

Engineers put faith in private enterprise, scientific methods and research.

25-83. **America at War.** *Automobile Engineer,* v. 34, March '44, pp. 111-114.

The situation regarding the available labor force, ferrous and non-ferrous metals, machine tools and rubber is discussed.

25-84. **Standardization of Aircraft Tubing.** John W. Offutt and David T. Marvel. *Steel Processing,* v. 30, March '44, pp. 159-161.

Recommendations for standardizing tubing sizes.

25-85. **China's Metal Industries at War.** *Metals & Alloys,* v. 19, March '44, pp. 600-603.

Pictorial study of operations of China's war plants.

25-86. **"Our Business Is Improving."** Francis Sill Wickware. *Scientific American,* v. 170, April '44, pp. 169-170, 172.

Research facilities are made available for small business through the activities of the Armour foundation. Without huge investments, industries that cannot otherwise afford research laboratories are placed on the same basis as big business.

25-87. **Tool Steel Coding.** *Iron Age,* v. 153, March 30, '44, pp. 36-40.

By substituting for proprietary names a mark and

number code based on chemical analysis of the tool steels, the Consolidated Vultee Aircraft Corp. has been successful in increasing cutting tool efficiency and improving tool life. Details of this system outlined.

25-88. **Materials Standardization.** S. B. Ashkinazy. *Mechanical Engineering,* v. 66, April '44, pp. 259-263.

The material standards manual; selection, forms, and types of material, purchase information. Standard full widths and lengths, chemical composition, physical and mechanical properties, bend radii, heat treatment. Material sizes, dimensional tolerances. Product engineer has final authority in use of standard materials; standards engineer advises on use of non-standard material. Advantages of standardization. 19 ref.

25-89. **Puts Out Fire Automatically with No Mess.** *Industrial Finishing,* v. 20, April '44, pp. 52, 54, 59.

Automatic fire extinguisher system protects stored inflammable liquids from destruction by fire; discovers fire, sounds alarm, shuts fire doors, closes ventilating louvers, stops fans, and discharges carbon dioxide which quickly reduces oxygen content of room air to a point where fire cannot burn—and no mess to clean up.

25-90. **After-Glow Technique of Template Reproduction.** Thomas Miles. *Product Engineering,* v. 15, April '44, pp. 276-278.

There are now several template reproduction methods that utilize the glow from phosphorescent materials that have been subjected to X-rays. The latest and best known of these methods are discussed and evaluated.

25-91. **Efficient Handling.** *Steel,* v. 114, April 3, '44, pp. 114-115, 164.

Mechanized handling slashes cost.

25-92. **Some Problems in Organizing Industrial Research.** W. M. Peirce. *Metals Technology,* v. 11, April '44, Tech. Pub. 1726, 16 pp.

Some of the factors which seem vital in the primary conception of the function of research, in the internal structure of the research department, in the control of research, and in the reporting of research. There is no one best and unchangeable pattern for organizing a research department. Organizations are structures built of individuals and an organization chart is only the post factum blueprint of a structure built on the job from the best material which we can secure.

25-93. **Abrasive Belts Recoated.** J. S. Siefen. *Iron Age,* v. 153, April 6, '44, pp. 58-59.

Abrasive belts when worn out recoated by brushing on one coat of "Brushing Nuglu" which is a mixture of a liquid cold glue and aluminum oxide grain.

25-94. **What's Ahead for the Metalworking Industry.** *Steel,* v. 114, April 17, '44, pp. 67-70.

Time factor for reconversion to peacetime production will vary among plants as to size as well as among segments of the industry. Maintenance of present employment and production levels in postwar period expected by high percentage of manufacturers.

25-95. **Small Metalworking Plant Preparing Now for Transition to Peacetime Activities.** Glenn L. Bybee. *Steel*, v. 114, April 17, '44, pp. 76-77.

Peacetime addition to production facilities will be unemployment stop-gap. Fund being set up to meet future needs. Prewar customer contacts kept alive. Expect to make changes in materials and machines.

25-96. **Rivet Handling Revolutionized.** *Steel*, v. 114, April 17, '44, pp. 98-99.

Rivets packed in cellophane. The bag is stamped with the rivet's size, and is packed automatically. The worker is saved time in finding the size needed and few rivets are dropped.

25-97. **Industrial Study Analyzes Postwar Manufacturing Opportunities.** *Western Metals*, v. 2, April '44, p. 7.

Iron and steel products expansion outlined.

25-98. **Watertown Arsenal 1816-1944.** *The Houghton Line*, vol. 12, no. 6, April-May '44, pp. 37-48.

Fifth in a series of articles describing the arsenals of America. History, facilities, procedure for making gun tubes.

25-99. **Which Small Motor to Use?** C. T. Button. *Machine Design*, v. 16, April '44, pp. 125-128.

Principles peculiar to different types of motors, advantages and disadvantages; future developments.

25-100. **Choosing the Right Material.** H. W. Gillett. *Machine Design*, v. 16, April '44, pp. 172-174.

How to insure quality and freedom from scatter more important than how to make chemical and mechanical post-mortems after service failure has occurred. 6 ref.

25-101. **Production Schedules Met by Systematic Motor Maintenance.** D. W. McGill and W. W. McCullough. *Machinery*, v. 50, April '44, pp. 148-153.

Comprehensive survey of causes of motor failure, together with definite instructions on the steps to be taken to avoid them. Particular attention to bearings and lubrication.

25-102. **Will it Pay to Clean Water Lines?** B. A. Noel. *Blast Furnace & Steel Plant*, v. 32, April '44, pp. 455-456.

The problems to be solved are: What is the condition of the interior of the pipe lines in this plant in terms of carrying capacity? What tests need be performed to determine their condition? Would it pay to have the lines cleaned?

25-103. **Production Problems in Small Parts Manufacture.** C. P. Roberts, and E. B. Neil. *Tool & Die Journal*, v. 10, April '44, pp. 87-90, 110.

Improving the finish by improving the reamer, effect of smooth surface under plating on wearing qualities, tips on redesigning to permit faster production.

25-104. **The Hazards of Carbon Monoxide: IV.** Frank S. Rossiter. *Industrial Heating*, v. 11, April '44, pp. 552, 554, 556, 612.

Hazards from carbon monoxide in industry, commercial establishments and homes. Sources of the gas, its effects on the human system when absorbed, methods for the resuscitation of gassed persons, and methods

for testing for the presence of carbon monoxide in the atmosphere are also described.

25-105. **Plant Distribution Systems for Oxygen and Acetylene.** Herman Ullmer. *Iron and Steel Engineer,* v. 21, April '44, pp. 40-48.

So widely has the use of oxygen and acetylene been adopted in the production of iron and steel that practically every plant has gone to distribution systems serving large, permanent consumptions from central points.

25-106. **Pressure on Tool Builders Growing.** J. C. Sullivan. *Steel,* v. 114, May 1, '44, pp. 66-67.

Industry seeks to meet delivery schedules facing increasingly acute manpower shortage with unexpected resurgence in demand developing. Situation complicated by extensive subcontracting on other types of war production.

25-107. **What's Ahead for the Metalworking Industry?** *Steel,* v. 114, May 1, '44, pp. 73-76.

Disposal of government-owned plants and facilities to present troublesome problem in some sectors of the metalworking industry though percentagewise few companies will be affected. Expectations high for continued extensive subcontracting after the war.

25-108. **Self-Limiting Hoist Drive Developed.** *Iron Age,* v. 153, May 4, '44, page 51.

New electric hoist drive for cranes, the important feature of which is an exciter embodying a cross-flux principle.

25-109. **Template Reproduction Methods.** Thomas Miles. *Iron Age,* v. 153, May 4, '44, pp. 52-55.

Numerous methods of transferring engineering information onto tooling and fabrication materials are being used by aircraft manufacturers. Methods now in use reviewed, and recommendations based upon the ability of any process to fulfill a particular requirement.

25-110. **Broken Taps Disintegrated Electrically.** Stanley H. Brams. *Iron Age,* v. 153, May 4, '44, pp. 60-61.

Removal of broken tools from work in which they have become lodged has always been a problem. Newest method of such recovery is by electric disintegration of the core of the tool, permitting easy withdrawal of the residual outer segments.

25-111. **Primary-Exposure X-ray Method for Reproducing Templates.** Thomas Miles. *Product Engineering,* v. 15, March '44, pp. 190-193.

Advantages and limitations of the primary-exposure method of template reproduction, one of the two X-ray methods now in use. Procedures for preparing layouts and metal negatives are given in full, as well as details of the reproduction process.

25-112. **Steps Up Production 12-Fold on Many Items.** G. W. Birdsall. *Steel,* v. 114, May 8, '44, pp. 102-104, 152, 154, 156.

Relatively small plant making highly specialized equipment employs many shortcuts that increase output to meet unprecedented demands. Redesigns take care

of material shortages, permit use of faster production methods.

25-113. **Fork Truck-Tractor Train Combination Works Well in Handling Steel Sheets.** *Steel,* v. 114, May 8, '44, pp. 117-118.

Solar-Sturges has found that a combination of fork trucks and tractor trains provides a flexible arrangement for handling incoming material and keeping it flowing at the correct rate to the stamping presses.

25-114. **Centralized Soluble-Oil System Pays for Itself in Two Months.** *American Machinist,* v. 88, April 27, '44, p. 97.

Installation cost of the centralized soluble-oil mixing and pumping equipment was $700; in reduction of maintenance labor alone, this sum was saved in two months.

25-115. **Metallurgical Research.** *Canadian Metals and Metallurgical Industries,* v. 7, April '44, pp. 22-29.

Excellent facilities provided by new laboratories at Bureau of Mines, Ottawa.

25-116. **Balancing Rotating Parts.** John E. Hyler. *Modern Machine Shop,* v. 16, May '44, pp. 160-162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192.

Methods, technique, and equipment employed in the balancing of rotating parts for smooth running at high speeds.

25-117. **Research for Aeronautics—Its Planning and Application.** W. S. Farren. *Journal of the Aeronautical Sciences,* v. 11, April '44, pp. 95-109.

The aim of research; the independent worker in research; research on a large scale; a survey of 25 years' achievement; drag reduction; weighty analysis; structural developments; stability and control; power plant developments. Summary—the task of research; problems of the immediate future; the management of research for aeronautics.

25-118. **Progress in Aluminum Therapy.** W. D. Robson. *The Canadian Institute of Mining and Metallurgy,* No. 384, April '44, pp. 172-179.

Harmlessness of aluminum; proposal to treat human silicosis; selection of individuals for treatment; examination of subjects; apparatus used to provide aluminum; characteristics of aluminum; treatment; results of treatments; conclusions regarding aluminum; aluminum and tuberculosis; field for aluminum therapy; research in the United States; application of aluminum therapy; control of aluminum therapy.

25-119. **Aluminium Therapy in the United States.** J. W. G. Hannon, *The Canadian Institute of Mining and Metallurgy,* No. 384, April '44, pp. 180-184.

Exposure; pathology; symptoms; methods of treatment; results of the treatments; further studies.

25-120. **The Engineering Aspects of Aluminum Prophylaxis.** A. W. Jacob. *The Canadian Institute of Mining and Metallurgy,* No. 384, April '44, pp. 185-202.

Apparatus used in the development of aluminum prophylaxis sampling; dispersing; powder used in

prophylactic treatment; properties of the powder; concentrations used in silicosis prevention; application of aluminum prophylaxis; pressure necessary for dispersal; installation and operation of blowers; facilities for aluminum prophylaxis at McIntyre; the attitude of the workmen to aluminum prophylaxis; aluminum prophylaxis and ventilation.

25-121. **Dynamiting Frozen Drill Ends.** Nels Sorenson. *Metal Progress,* v. 45, May '44, p. 904.

Salvaging crankshafts by blasting broken drills loose with dynamite.

25-122. **Production Planning.** *Steel,* v. 114, May 15, '44, pp. 90-91, 103, 106.

Setup in Curtiss-Wright's St. Louis plant provides suggestions for engineers facing tough production assignments.

25-123. **Modern Lubrication.** E. M. Barber; Albert G. Ingalls. *Scientific American,* v. 170, May '44, pp. 211-213.

When a true understanding of the basics of the lubrication process was reached bearings and lubricants could be designed to make possible today's machines.

25-124. **Lithographic and Electrolytic Reproduction of Templates.** Thomas Miles. *Product Engineering,* v. 15, May '44, pp. 327-328.

Dry-offset printing, general lithographic methods, Robinson litho method, electrolytic reproduction.

25-125. **Getting and Keeping Technical Talent Today and in 40-X.** *Modern Industry,* v. 7, May 15, '44, pp. 42-46.

Management has tough problem in shortage of engineers, chemists, technicians, and other professionals. Some sound solutions, and warning of postwar headaches.

25-126. **Industry's Postwar Pathfinder — Market Research.** *Modern Industry,* v. 7, May 15, '44, pp. 48-50, 52, 54, 56, 58, 60, 62.

More and more companies are using it in the search for new opportunities in products and markets.

25-127. **Safety Color Code for Industry.** *Iron Age,* v. 153, May 18, '44, p. 83.

Uniform system of color signals for industry proposed by the finishes division of E. I. du Pont de Nemours & Co.

25-128. **Industrial Study Analyzes Postwar Manufacturing Opportunities.** *Western Metals,* v. 2, May '44, p. 30.

Rapid wartime industrialization of the West. New field of opportunities for development of machinery production by Los Angeles chamber of commerce.

25-129. **Construction of the Fontana Plant of the Kaiser Co., Inc. Iron and Steel Division.** George Havas. *Blast Furnace & Steel Plant,* v. 32, May '44, pp. 551-556.

Plant construction and equipment.

25-130. **Tooling Dock Speeds Airframe Fixture Assembly.** John Haydock. *American Machinist,* v. 88, May 25, '44, pp. 91-102.

What the airplane has done for transportation, the

tooling dock has paralleled in the field of assembly tooling. Each has made three new advances: increased speed, greater precision and the mastery of the third dimension.

25-131. **The Steel Industry's Place in Safety.** William A. Irvin. American Iron and Steel Institute Advance Paper, May 25, '44, 7 pp.

Program of intelligently planned and consistently executed safety measures sponsored by the steel industry during the past two years.

25-132. **Control of Low Temperature Refrigeration.** A. B. Newton. *Refrigerating Engineering,* v. 47, June '44, pp. 461-464, 496, 498.

New industrial uses of low temperature refrigeration control systems which have proved most useful in wartime manufacture.

25-133. **Keying Research to Battle.** G. M. Barnes. *Mechanical Engineering,* v. 66, June '44, pp. 359-362.

Ordnance department responsibilities, industry prompt and vigorous, new weapons, weapons for special needs, rifles superior, "results speak for themselves," aircraft cannon, American bazookas, best mobile artillery, howitzer fire devastating, effective bombs, body armament for aviators.

25-134. **Heat Transfer: Conduction, Radiation and Convection.** Herman J. Stoever. *Chemical & Metallurgical Engineering,* v. 51, May '44, pp. 98-101, 106-107.

Lists the more important simple equations and explains briefly their derivation and use.

25-135. **Engineers Need More Than Mere Technical Capacity.** J. L. Perry. *Mining & Metallurgy,* v. 25, June '44, pp. 291-293.

Asserts that engineers must be more proficient in human engineering. They must be better organizers, develop a better sense of team play, widen their interests and activities, and they must take more responsibility for successful management.

25-136. **Practical Problems of Postwar Mineral Industries Education.** J. W. Stewart. *Mining & Metallurgy,* v. 25, June '44, p. 293.

It appears entirely possible that we may expect a temporary lowering of prewar standards at many schools.

25-137. **Order Scheduling in a Specialty Tube Mill.** Norman F. Rearic. *Steel,* v. 114, May 29, '44, pp. 110-112, 114, 116, 130-131.

Controlled materials plan employed by tubemaker to expedite numerous orders through various phases of treatment is responsible for delivering 85% of all commitments scheduled for manufacture in a given month as promised. Each step of the procedure is explained in detail.

25-138. **A New Federal Service Offered to Small Manufacturers.** Maury Maverick. *Product Engineering,* v. 15, June '44, pp. 361-363.

How the Technical Advisory Service of the Smaller War Plants Corp. obtains answers to technological

problems facing small plants not equipped with research laboratories. Operation of this government agency is described with an announcement that it "will soon offer the means of opening the doors to many new essential non-military products and inventive ideas."

25-139. **Methods Engineering in the Metal Industries.** Edwin Laird Cady. *Metals & Alloys*, v. 19, May '44, pp. 1145-1149.

Control of methods will profoundly influence the speed and efficiency of reconversion in the transition and post-war periods. Examples of its applications in the metal industries.

25-140. **A Shop Liaison System.** *Steel*, v. 114, June 5, '44, pp. 112, 114.

Gets production and design improvements from idea form to actual use in one-tenth the ordinary time.

25-141. **Bar Storage System.** H. C. Morrison. *Steel*, v. 114, June 5, '44, pp. 116, 118.

Eliminates much individual handling of bars, facilitates moving into and out of storage, has interesting possibilities for all screw machine departments.

25-142. **Selecting Synchronous Motors.** K. M. Patterson. *Steel*, v. 114, June 5, '44, p. 120.

Simplified by tabulation of torques, starting kilovolt-amperes and reduced starting kilovolt-ampere methods for low and high speed 60-cycle motors.

25-143. **Research for Aeronautics.** W. S. Farren. *Aircraft Engineering*, v. 16, April '44, pp. 106-111.

Planning and application.

25-144. **Screw Threads.** *Aircraft Production*, v. 6, May '44, p. 209.

Proposals for an international system.

25-145. **The Tin Research Institute's Activities in Post-War Years.** John Ireland. *Tin & Its Uses*, No. 15, March '44, pp. 17-18.

The problem involved, semi-industrial investigations, technical information bureaus, suggested location of bureaus, development and publicity, the council of control.

25-146. **Production Planning and Control.** L. J. King. *Iron & Steel Engineer*, v. 21, May '44, pp. 57-61, 78.

Production planning and control seek to answer the what, when, where and how of manufacture, so that products, service and costs will be the best possible.

25-147. **Materials Weight Tables.** *Tool & Die Journal*, v. 10, June '44, pp. 97-101.

Designed to reduce to a minimum the work of calculating the total weight of steel required for a given press run, the tables are readily applicable for other materials and purposes.

25-148. **Magnesium Dust Hazard.** *Light Metals*, v. 7, May '44, pp. 237-239.

Safety precautions required in the machining of the ultra-light alloys in order to avoid unnecessary risks associated with these materials in the finely divided form.

25-149. **Convair Machine Sorts 50,000 Rivets Hourly.** *Aviation,* v. 43, June '44, pp. 152-153, 296.

Dual-feed mixed-rivet unit developed at Consolidated's Nashville plant.

25-150. **Steel Simplification.** Earl Adkins. *Steel,* v. 114, June 19, '44, pp. 94, 97.

With its company simplification program just begun, the author reports a 20% reduction in number of different steels stocked, with significant savings already being obtained.

25-151. **Heat Effects in Lubricating Films.** A. C. Hagg. *Journal of Applied Mechanics,* v. 11, June '44, pp. A-72-A-76.

Heat effects in lubricating films analyzed on the basis of simple shear of the lubricant, Reynolds logarithmic formula relating lubricant viscosity and temperature, and an equation relating the heat generation and heat flow in the film. The film-temperature dependence on velocity determined, and the result used to obtain the shearing stress and shearing rates. An approximate means for judging the importance of film heating in a given case in terms of velocity and lubricant viscosity is suggested.

25-152. **Shrink-Fit Stresses and Deformations.** A. W. Rankin. *Journal of Applied Mechanics,* v. 11, June '44, pp. A-77-A-85.

The expressions for the stresses in a solid cylinder of infinite length caused by the action of an applied radial stress distributed uniformly over a single circumferential ring of finite length on the surface of the cylinder. Test measurements of shaft deformations due to shrink pressures are included to illustrate the application of the theoretical results. 9 ref.

25-153. **Improvised Equipment for the Toolroom.** R. Harries. *Machinery* (London), v. 64, May 4, '44, pp. 477-483.

With the help of a skilled fitter, the small concern can improvise some of its own toolroom equipment. Some designs for such measuring equipment. Shows methods of construction.

25-154. **Measurements of the Adhesion Component in Friction by Means of Radioactive Indicators.** B. W. Sakmann and J. T. Burwell and J. W. Irvine. *Journal of Applied Physics,* v. 15, June '44, pp. 459-473.

In friction experiments material is exchanged between the sliding surfaces. The development of a radioactive tracer method by means of which one could detect quantities of metal as small as 10^{-4} microgram. After the friction experiments, the riders were tested for the presence of radioactive material, and the quantity of metal deposited on the rider was determined as a function of various parameters. A copper-beryllium base surface was used for all measurements reported here.

25-155. **Safe Practices in Working Magnesium.** Arthur C. Stern and Charles B. Ford. *Iron Age,* v. 153, June 22, '44, pp. 64-70.

Approved safe practice recommendations for the prevention and control of fire and explosion hazards in magnesium alloy fabrication plants. Occupational health hazards are also pointed out. 12 ref.

25-156. **Steel Reclassification—A Vital Postwar Problem.** A. L. Hartley. *Steel,* v. 114, June 26, '44, pp. 86-87, 136.

Outline of a general procedure for the establishment of a steel standardization program.

25-157. **Locking System for Threaded Inserts and Studs.** *Steel,* v. 114, June 26, '44 p. 128.

A ring with serrations inside and out has been developed to lock the stud in place after installation.

25-158. **The Use of Gas in Processing the Materials of Tomorrow.** Lawrence E. Biemiller. *Steel Processing,* v. 30, June '44, pp. 375-378.

Various types of industrial gas equipment which have been recently developed, and new techniques which are being used.

25-159. **Endless-Chain Monorail System, 2 Miles Long.** Robert Wells. *Steel,* v. 115, July 3, '44, pp. 96, 98, 101, 102.

Monthly production quotas for Helldivers are met regularly at Curtiss-Wright Corp.'s Columbus plant with aid of eight different kinds of conveyors.

25-160. **A List of Preferred Steels.** A. L. Hartley. *Steel,* v. 115, July 3, '44, pp. 88-89, 136, 138, 142, 144, 146.

A simplified and restricted list of preferred steels is long overdue and it can be successfully established. Such a program will result in the savings of millions of dollars annually to both producer and consumer. At the same time, it will enable machinery builders to produce better products.

25-161. **Alien Patents Available to Industry.** *Steel,* v. 115, July 10, '44, pp. 101-102, 104.

List of enemy patents of interest to the metalworking industries.

25-162. **Three Dimensional Drawings Speeded by Photographic Method.** *Iron Age,* v. 154, July 13, '44, pp. 61-62.

Three dimensional renditions from orthographic projections are used by those doing assembly work. Martin Axonograph produces a print in any one of the three trimetric planes—plan, face, or side—to fit the needs of any particular job.

25-163. **Bits and Pieces.** *Metal Progress,* v. 46, July '44, pp. 105-108.

Emergency Tempering Equipment, by Philip F. Atwood. Soft Soldering on Zinc Plated Parts, by H. L. Campbell. Rotate During Electro-Polishing, by Albert Guy. Armored Nibs on Core Boxes, by S. H. Horn. Preventing Scale From Affecting Hardenability Tests, by R. G. Townsend. Mixing Electrolytic Polishing Solution, by Jack H. Goodyear. Testing Continuity of Chromium Flash, by C. H. Aneshansley. Macroscopic Etch for Weld Specimens, by Philip R. Sperry. Computing A″ or Ms (Transformation Temperature on Quenching) From Analysis, by Louis A. Carapella.

25-164. **Alien Patents Available to Industry.** *Steel,* v. 115, July 17, '44, pp. 119-120, 122, 172, 174, 176, 178.

A list of enemy patents on metallurgy.

25-165. **Shrink Fits.** C. S. Lucas. *Steel,* v. 115, July 17, '44, pp. 110-112, 160, 162.

Facilitated through use of induction heating coils to heat bores into which parts are to be fitted. Heating cycle shortened.

25-166. **The Martin Axonograph.** W. G. Wilkinson and H. C. Bartholomew. *Tool & Die Journal,* v. 10, July '44, pp. 110-113.

Description of process.

25-167. **Material Handling.** R. W. Mallick. *Mechanical Engineering,* v. 66, July '44, pp. 447-450.

Field for industrial progress. Equipments which have been developed or installations made for improved material-handling conditions.

25-168. **Master Tooling Dock.** C. W. Greaves. *Steel,* v. 115, July 24, '44, pp. 97-100.

Permits fabrication of fixtures on volume production basis.

25-169. **Gas Turbines and Turbosuperchargers.** Sanford A. Moss. American Society of Mechanical Engineers *Transactions,* v. 66, July '44, pp. 351-371.

Developments relating to the gas turbine and particularly to the perfection of the airplane engine turbosupercharger. United States and foreign gas turbine research projects and details of advancements in such items as nozzles, compressors, and the like discussed. 48 ref.

25-170. **Air Expanded Plastic Rivets.** *Iron Age,* v. 154, July 27, '44, pp. 52, 53.

Compressed air is used to expand a new type preheated hollow plastic rivet which can be used to attach fabric to metal, wood or plastic.

25-171. **Plastics vs. Metals.** Don Masson. *Mining & Metallurgy,* v. 25, August '44, pp. 369-372.

Wide use of plastics as substitutes an insignificant factor in metal tonnage—metal consumption may be stimulated.

25-172. **Strength of New Plastics Compares with That of Metal.** John Delmonte. *Machine Design,* v. 16, August '44, pp. 119-122.

Application of resins to laminates, curing conditions, disadvantages, properties, applications.

25-173. **New Trimetric Drawing Technique.** W. G. Wilkinson and H. C. Bartholomew. *Machine Design,* v. 16, August '44, pp. 139-140, 188.

A device for photographically translating a conventional orthographic drawing into a scale representation of one face or dimension of a trimetric projection. By adjusting the machine and the position of the print on the copy board in accordance with a predetermined scale, it is possible to produce the resulting print in any one of the three trimetric planes—plan, face or side—to fit the needs of each particular job.

25-174. **Bits and Pieces.** *Metal Progress*, v. 46, August '44, pp. 295-298.

Identification of Brinell balls. Spotting cobalt high speed. A film dryer. Sampling molten metals. Unusual type of precipitation. Wrought iron pipe replaces copper bus bars. An improved method of flow line etching for nitralloy. Simple die converts press into an upsetter.

25-175. **Dust Collecting Systems.** F. C. Morey. *Iron & Steel Engineer*, v. 21, July '44, pp. 45-51.

Recommended practices in the design and operation of dust collecting systems as applied to grinders, tumbling mills, sandblast equipment, mixers, crushers, etc.

25-176. **Dust Control for Swing Frame Grinders.** John M. Kane. *The Foundry*, v. 72, August '44, pp. 91, 206.

Use of booth type hood.

25-177. **Gas Turbine Development — Past and Present.** P. M. Heldt. *Automotive & Aviation Industries*, v. 91, August 1, '44, pp. 26-30, 54, 56, 58, 60, 64.

Applications, limitations, principles of operation, basic types.

25-178. **Joining Aluminum Alloys.** E. C. Hartmann, G. O. Hoglund, and H. A. Miller. *Steel*, v. 115, August 7, '44, pp. 84-85, 122, 124, 126, 128, 132, 134, 136, 138.

Riveting methods.

25-179. **Gas Turbine Developments.** J. K. Salisbury. *Steel*, v. 115, August 7, '44, pp. 104, 106, 108, 146, 148.

Cause engineers to predict important fields in postwar cargo and transport aircraft. Approach to limit of gasoline engines comes in sizes (2000 to 8000 hp.) at which gas turbine becomes highly efficient power source.

25-180. **Relative Costs of Parts Made by Five Different Methods.** *Product Engineering*, v. 15, August '44, pp. 536-540.

Analyzes relative costs of parts made by forging, sheet-metal forming, screw machine, permanent-mold casting and flame cutting.

25-181. **Packaging in Process Protects Precision Parts.** *Iron Age*, v. 154, August 10, '44, pp. 50-51.

Corrugated tote box containing die cut pads or separators to protect parts in process cuts rejection rate for bronze bushings and bearings from 60 down to 5%.

25-182. **Tiny Screw Assemblies.** Carleton Cleveland. *Machine Tool Blue Book*, v. 40, August '44, pp. 241-242, 244, 246.

With the Pix-up Finder and Adjusto-Tray, screws are sorted, held in "heads-up" position, picked up entirely by mechanical (not magnetic) action, placed and driven, in what might well be classed as a single operation.

25-183. **Prefabrication Methods in Aircraft Production.** *Machinery* (London), v. 64, June 22, '44, pp. 673-675.

High rate of production due to the full utilization of the production line, and the extensive use made of templates.

25-184. **Multiple Riveting of Aircraft Parts.** J. E. Cooper. *Iron Age,* v. 154, August 24, '44, pp. 56-58.

Use of pressure rails or pressure pins prevents assemblies being misplaced between the anvils. With the aid of special handling equipment women operators have been able to upset rivets at the rate of 2300 per hr.

25-185. **Jessop Steel Promotes Metallurgical Research by Erecting a New Laboratory.** *Blast Furnace and Steel Plant,* v. 32, August '44, pp. 943-948.

General plan of building; planning and supervision; experimental heat treatment; sample preparation; metallography; special testing; quality control—routine testing and statistical analyses.

25-186. **Maintenance Systems.** Wm. A. Perry. *Blast Furnace and Steel Plant,* v. 32, August '44, pp. 958, 960-961, 977, 984.

Pump maintenance; plan for steam generator; plan for turbine generator; repairing steam turbine.

25-187. **Metallurgical Aspects of the Bofors Anti-Aircraft Gun.** Walter M. Mitchell. *Industrial Heating,* v. 11, August '44, pp. 1231-1232, 1234.

The general methods by which the manufacture of the Swedish Bofors was adapted to American practices and standards, and some of the metallurgical difficulties which were met and overcome.

25-188. **The Ordered Flow of Materials at the Willow Run Plant.** Franklin M. Reck. *Aero Digest,* v. 46, August 1, '44, pp. 68-74, 142.

System controlling the procurement, manufacture, and assembly of 2,500,000 parts.

25-189. **Small Diesel-Electrics Adapted to Steel Mill Switching.** F. H. Craton. *Steel,* v. 115, August 28, '44, pp. 102, 104, 127-128, 131.

Heavy 2-axle locomotives up to 80 tons and equipped with two identical power units meet requirements found in most steel mill yards in moving materials. Choice of high or low-speed equipment depends on such factors as character of service, number of hours to be used annually, type of maintenance and number of locomotives operated in the plant.

25-190. **Production Control Keeps Work Flowing Through Ohio Tool Co. Plants.** Robert Dixon, *Steel,* v. 115, August 28, '44, pp. 110, 112, 131.

Routing, dispatching and scheduling prime factors of production control. Tools include blueprints (both for reference and plant work), order files, ledger and shipping, routing sheets, stock control records and files, bin tags and storage, tool control system, drawing number system, material identification system and department identification symbols.

25-191. **Practical Ideas.** *American Machinist,* v. 88, August 31, '44, pp. 105-110.

Special holder varies uses of indicator. Paint priming rolled aluminum sheets. Toolholder life doubled by redesigning. Hydro shrink block eliminates hand forming. Portable device for handling car wheels. Safety stop for use on multiple-spindle drill heads. Chuck jaw adapters.

25-192. **Torque Wrenches Aid in Precision Assembly of Tubing.** John Curlett. *American Machinist,* v. 88, August 31, '44, pp. 94-96.

Standard torque loads have been applied to threaded connections in Douglas airplanes and torque wrenches for tubing.

25-193. **The Action of Extreme Pressure Lubricants.** *Lubrication,* v. 30, August '44, pp. 73-80.

"Film-strength"; thick-film; and boundary lubrication; temperatures of contacting high spots; prevention of welding; composition of extreme pressure lubricants. 7 ref.

25-194. **Examination of Various Fuel and Header Tanks Taken from Captured Enemy Aircraft.** *Metallurgia,* v. 30, June, 44, pp. 77-85.

Parts examined represent various fuel and header tanks taken from a Messerschmitt 109, a Heinkel III, a Fiat Cr. 42, and a Focke-Wulf 190.

25-195. **The European Patent Situation in the Immediate Post-War Period.** S. T. Madeley. *Metallurgia,* v. 30, June '44, pp. 95-96.

Reconstruction period after the war will create many problems concerning patents. Discussion of some of the problems.

25-196. **Tolerances and Inaccuracies in Physics.** Charles G. Darwin. *Foundry Trade Journal,* v. 73, June 29, '44, pp. 169-174.

Importance of studying the principles of tolerances.

25-197. **Industrial Engineering in War Production.** C. P. Spangler. *Iron & Steel Engineer,* v. 21, August '44, pp. 74-75, 82.

Ultimate productive speed comes only from the combination of the best mechanical methods and the maximum cooperation of every worker.

25-198. **Accelerated Programs in Engineering Schools—Their Good and Bad Features.** J. L. Bray. *Mining & Metallurgy,* v. 25, Sept. '44, pp. 420-422.

Present method of operation likely to have marked effect on postwar engineering education.

25-199. **Possibilities of the Master Tooling Dock.** Leland A. Bryant. *Modern Machine Shop,* v. 17, Sept. '44, pp. 188-190, 192, 194, 196, 198, 200, 205, 206.

Considerations in designing fixtures for the master tooling dock.

25-200. **Color Code Identifies Correct Lubricant for Each Bearing.** Roger M. Baker. *Power,* v. 88, Sept. '44, pp. 79-81, 208.

Practical experience develops a color system that insures lubrication of each bearing with correct oil or grease.

25-201. **Heat Resisting Resins Have Wide Applications.** *Iron Age,* v. 154, Sept. 7, '44, pp. 81, 160.

Commercial production of Silicones make available to industry a class of fluids, greases and resins having unique stability against heat and chemical attack.

25-202. **Bar Bucking Assemblies Speed Riveting.** *Iron Age,* v. 154, Sept. 7, '44, pp. 82-83.

A "floating" bar, which can be positioned against the shank of a rivet, and two or more spring actuated hammers which react against the back side of the bar in opposition to impulses from a conventional air rivet gun.

25-203. **Jet Propulsion—The Principles and the Metallurgy Involved.** *Metal Progress,* v. 46, Sept. '44, pp. 497-504, 512, 516.

Jet propulsion of steamships; aircraft applications in general; gas turbines for power generation; high temperature essential; jet-propelled aircraft; the robot bomber; rocket projectiles.

25-204. **Insuring Effectiveness in Engineering Training.** R. L. Maw. *Mechanical Engineering,* v. 66, Sept. '44, pp. 588-589, 612.

Instructor selection; participation of management; student selection; courses should demonstrate applications of principles.

25-205. **What About Standards in Postwar?** *Tool Engineer,* v. 14, Sept. '44, p. 99.

They educate, simplify, conserve and certify quality. Development of standards; trend of standardization.

25-206. **Extreme Pressure Lubricants.** J. J. Mikita. *Steel,* v. 115, Sept. 11, '44, pp. 102-104, 148, 150, 152, 154.

Industrial applications. Data on lubrication of gearing and machine parts involving steel-to-steel contacts under heavy pressure. 7 ref.

25-207. **Tool Shank Standards.** O. W. Boston. *Steel,* v. 115, Sept. 11, '44, pp. 115, 168.

Preferred sizes.

25-208. **The Engineering Profession Tomorrow.** Robert E. Doherty. *Mechanical Engineering,* v. 66, Sept. '44, pp. 602-604.

War lessons for engineers. What constitutes the engineering profession? Non-professional activities of engineers; planning the educational program for engineers; cultivating intellectual power.

25-209. **New Riveting Assembly.** Thomas A. Dickinson. *Tool Engineer,* v. 14, Sept. '44, pp. 74-76.

Rivet-bucking assemblies developed for aircraft-production improve workmanship and reduce worker fatigue. Types have been designed for application to automatic and manual riveting operations.

25-210. **Extending Life of Industrial Truck Tires.** C. B. Cook. *Iron Age,* v. 154, Sept. 14, '44, pp. 61-62.

Machine tool builder finds that turning or grinding down the lumps and removing the flat spots actually adds about 4 months to the normal life of industrial truck tires, thus not only conserving vital rubber but adding to the life of the truck.

25-211. **Non-Ferrous Alloy Specifications.** *Iron Age,* v. 154, Sept. 14, '44, pp. 66-98.

American Society for Testing Materials Specifications giving specification number, approximate alloy composition, condition, form and special requirements. Aeronautical Material Specifications giving number, approximate alloy composition, condition, form, and similarity

to other specifications. U. S. Army Specifications giving specification number, approximate composition, form, and similarity to other specifications. U. S. Air Corps Specifications giving specification number, approximate alloy composition, form and similarity to other specifications. Army-Navy Aeronautical Specifications giving specification number, approximate composition, form, similarity to other specifications. U. S. Navy Specifications giving specification number, approximate composition, form, and similarity to other specifications. Federal Specifications giving specification number, approximate composition, form, and similarity to other specifications. S.A.E. Specifications giving specification number, approximate alloy, form, and similarity to other specifications.

25-212. **Rivet Control and Conservation in Aircraft Production.** H. Watkins. *Machine Tool Blue Book,* v. 40, Sept. '44, pp. 139-140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162.

Convair's rivet delivery system.

25-213. **Automatic Riveting Realizes Manufacturing Economies.** Paul Wise. *Aviation,* v. 43, Sept. '44, pp. 139-141, 263-264.

Forethought and the application of a few simple rules could multiply production rates, reduce fabrication costs, and improve quality of work. Notes on specific tooling methods.

25-214. **Packaging for Postwar Export.** Donald C. Macdonald. *Iron Age,* v. 154, Sept. 21, '44, pp. 52-58.

Conclusions arrived at about the methods of packaging which will be required for metal products, the place of packaging in establishing postwar markets, and descriptions are given of the materials and methods which will be retained in the postwar era.

25-215. **Standards for the Acceptance or Rejection of Driven Rivets.** *Product Engineering,* v. 15, Sept. '44, pp. 628-631.

Tests of improperly driven rivets and acceptability limits for such rivets. Recommended acceptability standards for all the common rivet malformations shown in chart form.

25-216. **Selecting Hydraulic Seals.** L. S. Linderoth. *Machine Design,* v. 16, Sept. '44, pp. 119-128.

Classification of packings; importance of surface finish; fastenings; effect of fluids and temperature; static seals; allowable pressures; extreme-pressure seals; dynamic seals; V-ring or chevron packings; U-cup packings; O-ring packings; piston seals; rotating shaft seals.

25-217. **Vibration and Noise—Causes and Cures. II.** Colin Carmichael. *Machine Design,* v. 16, Sept. '44, pp. 99-104.

Proper procedure in effecting a cure is first to eliminate or diminish as much as possible the source of the trouble, and then—if vibration still exists—to isolate the source through the use of suitable materials or mountings.

25-218. **Centralized Lubrication Insures Bearing Life. I.** John W. Greve. *Machine Design,* v. 16, Sept. '44, pp. 113-118.

Piston valves. Delivers definite quantity to each bearing; lubricates every bearing on forger.

25-219. **Army Field Shops Repair and Rebuild Ordnance Equipment.** William J. Hargest. *American Machinist,* v. 88, Sept. 14, '44, pp. 125-128.

United States Army Ordnance engineers have designed and built maintenance depots in the European theater of operations for complete overhaul of automotive engines, motor cars, artillery and combat vehicles. Engine shops are set up for line production and do an annual business of millions.

25-220. **Bellows Sealing Device Protects Bearings from Abrasives.** Roger W. Bolz. *Product Engineering,* v. 15, Sept. '44, pp. 614.

Spring-actuated brass bellows which maintain continuous seal contact. The bearing seal was designed for the miller to cope with infiltration of abrasives severe enough to cause rapid destruction of the lubrication system and bearings.

25-221. **Modern Planning in an Airscrew Plant.** P. B. T. *Machinery* (London), v. 65, July 27, '44, pp. 91-95.

Speeding up of manufacture and assembly.

25-222. **Modern Planning in an Airscrew Plant.** P. B. T. *Machinery* (London), v. 65, August 3, '44, pp. 123-125.

Outstanding features of the Curtis-Wright Plant.

25-223. **Production Problems and Production Control.** E. C. Brekelbaum. American Welding Society Preprint, Oct. '44.

Problems arising in production welding and production control; factors that differ from other production set-ups, as machining operations. Production Control System compared to methods of wage incentive.

25-224. **From Rifles Back to Typewriters.** *American Machinist,* v. 88, Sept. 28, '44, pp. 121-123.

Careful planning combined with tapering off of war production enabled Smith-Corona to reconvert without any lost time and to use to advantage war-found knowledge and experiences.

25-225. **Modern Light Metal Processing.** W. B. Griffin. *Light Metal Age,* v. 2, Sept. '44, pp. 28-29.

Some of the versatile operations which a consumer deals with illustrated.

25-226. **Safety in the Handling of Magnesium Alloys.** *Western Metals,* v. 2, Sept. '44, pp. 60-63.

Principal hazards.

25-227. **Maintaining War Production by Machine Tool Lubrication.** Allen F. Brewer. *Machinery,* v. 51, Sept. '44, pp. 160-162.

Considerations in gear lubrication; lubrication of machine tool bearings; relation between load and oil viscosity; selection of lubricants; hydraulic oils.

25-228. **What About the Gas Turbine.** Edwin Laird Cady. *Scientific American,* v. 171, Oct. '44, pp. 157-159.

Fundamental reasons why the gas turbine is emerging from the dream stage.

25-229. **Dust in Steel Foundries.** *Engineering,* v. 158, August 25, '44, p. 152.

Recommended practice for decreasing dust disablement.

25-230. **Picture Drawings.** *Iron & Steel,* v. 17, August '44, pp. 581-582.

Trimetric scale for "solid" projections.

25-231. **The Structural Reinforcement of Liberty Ships.** *Welding Journal,* v. 23, Sept. '44, pp. 789-794.

The details of the design, the characteristics of the materials, the methods of construction and restrictions on ballasting during operation.

25-232. **Examination of Some Oil Coolers, Radiator Structures and Oil Tanks of Various Enemy Aircraft.** *Metallurgia,* v. 30, August '44, pp. 202-210.

Summaries of data resulting from the metallurgical examination of parts from enemy aircraft carried out at the request of the Committee on Non-Ferrous Parts in Enemy Aircraft. The parts examined represent various oil coolers, radiator structures and oil tanks, and the main results are detailed.

25-233. **Color Aids Improved System for Lubrication Control.** C. I. Kraus. *Steel,* v. 115, Oct. 2, '44, pp. 72-73, 126, 128, 130.

Effective plan routes each lubricant from barrel to bearing; highlights hidden lubrication points so none is missed; helps prevent over or under lubrication; reduces number of different lubricants required by 30 to 75%.

25-234. **Coffin Jacks.** *Steel,* v. 115, Oct. 2, '44, p. 97.

Solve problem in fitting bronze liners and collars on steel shafts.

25-235. **Some Aircraft - Engine Production Methods.** Martin M. Holben. *SAE Journal,* v. 52, Oct. '44, pp. 492-500.

Time, space, machinery, and skilled labor are all being used much more economically and efficiently because of the development of many automatic and multi-operational machines.

25-236. **A.I.S.E. Convention Warned Against Sacrificing Employment for Price.** *Iron Age,* v. 154, Oct. 5, '44, pp. 68-73.

The Unitemper mill; gas turbines for blast furnace blowers; design and operation of modern sintering plants.

25-237. **Integrated Handling.** Ezra W. Clark. *Steel,* v. 115, Oct. 9, '44, pp. 134, 298, 300, 302.

Saves $21.60 and 19 manhours per group of 36 valve units in shipping from supplier to assembly line; is excellent example of what can be done by improved palletizing for efficient handling of materials.

25-238. **Special Metal Shapes.** *Steel,* v. 115, Oct. 9, '44, p. 190.

Nearly half of all plants exhibit preference for special rolled and drawn sections to facilitate fabrication

by welding and other means. Wartime simplification program also may be expected to carry over into peacetime operations.

25-239. **Chemicals Used in Steel Industry.** J. L. Gregg. *Chemical & Engineering News,* v. 22, Sept. 25, '44, pp. 1555-1558, 1612.

Few appreciate the variety of chemicals employed in the manufacture of steels and the vast tonnage of many of these materials. Producers of these products will find this authoritative survey most illuminating in evaluating the market possibilities for chemicals in America's steel industry.

25-240. **Machine Shop Practice and Foundry Technique.** C. W. Marshall. *Foundry Trade Journal,* v. 74, Sept. 7, '44, pp. 11-12, 14.

Fostering cooperation to meet exacting post-war requirements.

25-241. **Centralized Lubrication.** C. I. Kraus. *Steel,* v. 115, Oct. 16, '44, pp. 96-97, 119-120.

Offers important economies by reducing manhours required to service machines, by cutting "down" time of machines, by affording better protection of enormous investments in plant equipment, by increasing production through fewer breakdowns. Power consumption also can be reduced, bearing life increased. Savings in lubricant and manpower pay for one installation every 93 days.

25-242. **Sub-Zero Cooling Benefits Discussed by Experts.** *Tool Engineer,* v. 14, Oct. '44, pp. 90-94.

Results of gage steel study; increasing tool life; super-cooling vs. tempering; more than transformation.

25-243. **Needed Better Teamwork Between Designer and Metallurgist.** Harry W. McQuaid. *Machine Design,* v. 16, Oct. '44, pp. 75-78.

The supervision of many special operations and the responsibility for the quality of the work has gravitated into the province of the supervisory metallurgist. The design engineer is equally interested in all these fields because they reflect in the performance of his designs. It is only by the wholehearted cooperation of the two types of engineers that either can be completely successful.

25-244. **Centralized Lubrication Insures Bearing Life.** John W. Greve. *Machine Design,* v. 16, Oct. '44, pp. 81-84.

Mechanical and restricted orifice lubricators.

25-245. **Directory of Materials.** *Machine Design,* v. 16, Oct. '44, pp. 174-246.

Iron, steel and non-ferrous metals listed by trade names. Index of alloys by principal constituents. New standard steel classifications. Producers of iron, steel and non-ferrous metals. Plastics and other non-metallics listed by trade names. Index of plastics and non-metallics by type. Producers of plastics and other non-metallics. Stampings producers. Forgings producers. Machine die castings producers. Custom molders of plastics. Machine finishes producers.

25-246. **Training in Metallurgical Chemistry.** L. G. Whybrow Palethorpe. *Chemical Age,* v. 51, Sept. 2, '44, pp. 227-230.

Needs of the engineering industry.

25-247. **Steel Plant Maintenance.** A. G. Henry. *Iron & Steel Engineer,* v. 21, Sept. '44, pp. 43-45.

Maintenance problems in war-time differ from those of prewar days . . . post-war maintenance will benefit from some of the methods forced upon us by present necessity.

25-248. **Pipe Cleaning.** L. R. Robinson. *Iron & Steel Engineer,* v. 21, Sept. '44, pp. 46-50.

Method employed for cleaning pipe depends entirely upon the size of the pipe and the nature of the deposit.

25-249. **Stocking and Handling Raw Material.** J. T. Thomas. *Iron & Steel Engineer,* v. 21, Sept. '44, pp. 67-76.

An efficient and effective set-up for handling raw materials must consider the nature and use of the material to be stocked, the location and extent of area available, the track system, type of cars used, and the equipment available.

25-250. **Longer Life for Industrial Diamonds.** *Purchasing,* v. 17, Oct. '44, pp. 106-107.

Proper use and maintenance of common grade industrial diamonds is essential for good results and conservation.

25-251. **Removing Broken Tools from Aluminum Alloy Parts.** *Metal Progress,* v. 46, Oct. '44, p. 715.

An electrolytic process which dissolves out the broken tool in a remarkably short time without detrimental effects to the part.

25-252. **The Dodge Chicago Forge Plant.** P. D. Aird. *Modern Industrial Press,* v. 6, Oct. '44, pp. 15-17, 20.

The largest airplane engine plant in the world, occupying some 500 acres of ground peculiarly suited for the requirements of the plant, where from 19 major plant installations a steadily increasing flow of 18-cylinder, 2200-hp. Wright air-cooled engines come monthly.

25-253. **Condensed Review of Some Recently Developed Materials.** *Machinery,* v. 51, Oct. '44, pp. 171-178.

Class of material; trade name; properties; applications.

25-254. **Recommended Methods for the Salvage Repair at the Factory of Damaged Parts on Airframes.** *Automotive Industries,* v. 91, Oct. 1, '44, pp. 31-35, 98.

Cracked flange beaded lightening holes; damaged rivet holes.

25-255. **Adhesives for Metals and Nonmetals.** Kenneth Rose. *Metals and Alloys,* v. 20, Oct. '44, pp. 959-963.

Classifies and describes the most important of these and indicates their present and future uses, possibilities and limitations.

25-256. **British Metallurgical Institutes and Research Associations.** J. W. Donaldson. *Metallurgia,* v. 30, Sept. '44, pp. 251-254.

A general resume of the work of the institutes and

research associations directly connected with metallurgical research work, and brief reference is made to some of the work carried out.

25-257. **Automatic Indexing Fixtures.** *Machinery* (London), v. 65, Sept. 28, '44, pp. 347-349.

Mechanically, electrically and pneumatically operated to enable accurate work to be performed at high speed.

25-258. **Ball and Roller Bearings.** L. Rosenfeld. *Automobile Engineer,* v. 34, Oct. '44, pp. 421-425.

A survey of various factors affecting friction. 14 ref.

25-259. **Material Weight Tables, Part VI.** *Tool & Die Journal,* v. 10, Oct. '44, pp. 107-111.

Calculating the total weight of steel.

25-260. **On the Mechanism of Friction.** Bernhard W. Sakmann and John T. Burwell. *Journal of Aeronautical Sciences,* v. 11, Oct. '44, pp. 381-386.

Reports the dependence of transfer of material on various parameters such as normal load, distance of travel, roughness and hardness of the sliding surfaces, nature of the contacting materials and lubrication. 7 ref.

25-261. **Postwar Holds Promise for Magnesium Industry.** Edw. S. Christiansen. *Aluminum & Magnesium,* v. 1, Oct. '44, pp. 21, 37.

Formation of the Magnesium Association.

25-262. **Standard Markings.** *Steel,* v. 115, Nov. 6, '44, pp. 120, 166.

Uniform system of markings only provides alphabetical identification for all bond types to designate hardness, special symbols, and single standard system for better consumer-manufacturer understanding.

25-263. **New Crane Hoist System Provides Maximum Speed Combined with Maximum Safety.** M. A. Whiting. *Blast Furnace and Steel Plant,* v. 32, Nov. '44, pp. 1317-1321, 1327.

Characteristics and applications.

25-264. **Research in the Iron and Steel Industry.** D. A. Oliver. *Blast Furnace and Steel Plant,* v. 32, Nov. '44, pp. 1341-1343.

The value of research and its development.

25-265. **Metallurgy of Enemy Aircraft (Me 109).** *Metal Treatment,* v. 11, Autumn '44, pp. 171-177.

Examination of the fuel and header tanks fitted to the Messerschmitt 109.

25-266. **The Light Metals and Plastics and Their Impact on the Steel Business.** L. S. Hamaker. *Industrial Gas,* v. 23, Nov. '44, pp. 15-16, 33-36.

Competition between metals as such, and between metals and plastics.

25-267. **Improved Riveting.** G. Eldridge Stedman. *Steel,* v. 115, Nov. 20, '44, pp. 102-104, 164.

Cuts work, reduces operations, doubles number of rivets that can be placed and headed per hour.

25-268. **Highly Efficient Skid-Load and Power-Truck System Facilitates Production of Hollow Steel Propellers.**

George E. Stringfellow. *Steel*, v. 115, Nov. 20, '44, pp. 128, 130, 134.

Effective in moving materials in production of hollow steel propellers is the combination of power trucks, skids, motorized hand trucks and conveyor systems.

25-269. **Easily Made Compressed Air Cylinder Has Many Uses.** C. W. Hinman. *American Machinist*, v. 88, Nov. 23, '44, p. 101.

Low cost device provides holding pressures from 400 to 600 psi. when used with shop lines having 80 psi. pressure.

25-270. **3-Point Support for Assembly Fixtures.** *Steel*, v. 115, Nov. 27, '44, p. 90.

Principle of the three-legged milking stool is utilized in jig which does not depend upon a level floor for accuracy. A jig builder's transit is used to establish center lines and critical points.

25-271. **American-British-Canadian Screw Thread Standards Near.** *Iron Age*, v. 154, Nov. 30, '44, pp. 65-67.

Truncated Whitworth threads; high duty studs; pipe threads; screw threads for compressed gas cylinder outlets; Acme threads; Buttress threads; instrument threads; unification of screw threads; design and drafting practice; tool and screw thread production.

25-272. **Development in Production Riveting.** *Machinery* (London), v. 65, Oct. 26, '44, pp. 459-461.

Bucking devices made in various assemblies to suit both manual and automatic riveting operations. Each assembly consists of a floating bar, which is positioned against the shank end of the rivet, and two more spring-actuated reacting plungers or hammers which operate against the back of the bar in response to impulses which are imparted by air-driven riveting guns.

25-273. **Economical Uses for Discarded Broken Tungsten-Carbide Tool Tips.** W. M. Halliday. *Metallurgia*, v. 30, Oct. '44, pp. 296-299.

Useful ways in which broken fragments of fractured carbide tool-tips may be utilized with great advantage. Broken tips may be used with a number of ordinary workshop tools, gaining the benefits of the high abrasive resistance of this material.

25-274. **The Coinage Metals in Antiquity, I.** Douglas Rennie Hudson. *Metallurgia*, v. 30, Oct. '44, pp. 313-320.

Historical development of gold, silver, bronze and electrum artefacts reviewed.

25-275. **Gas Turbines and Jet Propulsion.** *Canadian Metals and Metallurgical Industries*, v. 7, Nov. '44, pp. 44, 46.

Special advantages balance lower efficiencies.

25-276. **Model Construction.** A. J. Murphy. *Metal Progress*, v. 46, Dec. '44, p. 1275.

Methods for constructing space models.

25-277. **Short Cuts in Aircraft Production.** L. G. Smith. *Modern Machine Shop*, v. 17, Dec. '44, pp. 124-130.

"Ideas" that have been developed by Lockheed executives, engineers and employees to save time and material and step-up production.

25-278. **Rubber Tooling Aids Precision in Gun Plant.** Alfred Weiland. *Machinery,* v. 51, Dec. '44, pp. 148-155.

Rubber for guiding cutting tools and expanding holding devices in a naval ordnance plant where guns of highest quality are turned out on a production basis.

25-279. **Tabulated Data Speeds Balancing of Compressor Rotors.** Milton Hoeppner. *American Machinist,* v. 88, Dec. 7, '44, p. 97.

Dynamic balancing achieved by cutting away metal from one or more ribs inside rotor lobes to predetermined specifications.

25-280. **Indexing Templets Permit Accurate Riveting at High Speed.** R. M. Alexander. *American Machinist,* v. 88, Dec. 7, '44, pp. 109-110.

Photographs of master layouts serve as guides in preparing indexing templets. Savings in tooling are made by this means.

25-281. **Power Cylinder Functions.** John E. Hyler. *Machine Tool Blue Book,* v. 40, Dec. '44, pp. 235-236, 238, 240, 242, 244, 246, 248.

Hydraulic riveters have eliminated the noise and increased production efficiency from other standpoints.

25-282. **Manufacturing Shortcuts.** *Steel,* v. 115, Dec. 11, '44, pp. 126, 128, 130, 174.

West Coast company saves time, cuts costs with novel production methods involving machining, stamping, stretch-forming and swaging. Some machines designed and built in own shop.

25-283. **The Selection of Industrial Rubber Products.** Irwin H. Such. *Steel,* v. 115, Dec. 4, '44, pp. 112-115, 156, 159-160, 162, 164.

Five types of synthetics now being used in the manufacture of belting, hose, packing, linings, abrasive wheels and the like for the metalworking industries are proving satisfactory substitutes for natural rubber and have earned permanent place for many applications. Data presented on physical characteristics and types best suited for products.

25-284. **Diversified Manufacturing.** G. Eldridge Stedman. *Steel,* v. 115, Dec. 4, '44, pp. 120, 122, 124.

Heavy equipment of many types is produced at western plant specializing in construction from details of design to finished product.

25-285. **Covering Weatherproof Cable.** Robert M. Harbeck. *Wire and Wire Products,* v. 19, Dec. '44, pp. 837-840.

Covering solid wire concerned specifically with a new knitting process to manufacture weatherproof wire.

25-286. **Tube Turns Extends Forging Service to Aircraft and Automotive Fields.** Joseph Geschelin. *Automotive and Aviation Industries,* v. 91, Dec. 1, '44, pp. 20-23, 80, 82.

Facilities of Tube Turns, Inc., Louisville, Kentucky.

25-287. **Bearing Maintenance.** K. M. Glaesner. *Blast Furnace and Steel Plant,* v. 32, Dec. '44, pp. 1460-1461.

If maintenance of bearings is to be accomplished every effort must be taken to utilize the same quality control that is employed in the manufacture of new bearings. Facilities required are good lighting, filtered air, proper ventilation, and clean, well painted areas.

25-288. **Research Opens the Door.** Charles F. Kettering. *Scientific American*, v. 172, Jan. '45, pp. 7-12.

How industry has developed the philosophy of research, changing the picture from that of the lone inventor struggling against tremendous odds to the broad teamwork programs of today. Present applications of industrial research point the way toward solving some of tomorrow's important problems.

25-289. **Better Metals Through Research.** Fred P. Peters. *Scientific American*, v. 172, Jan. '45, pp. 13-15.

Outstanding war-time research-in-metals development is the sharing of data and efforts by manufacturers. The inevitable result is better materials and methods for peace-time products. These will be converted into applications of importance to industry and the public alike.

25-290. **Railways Roll on Research.** C. B. Peck. *Scientific American*, v. 172, Jan. '45, pp. 16-18.

Many problems became the subjects of research early in the history of the industry. Some of these have been under almost continuous investigation since. Practically no industry employing research in the development of its products has not made its contribution to the railways.

SECTION XXVI

STATISTICS

26-1. **What Happened in 1943.** *Iron Age,* v. 153, no. 1, Jan. 6, '44, pp. 64-126.

A general review followed by specific articles on non-ferrous metals, renegotiation, labor, machine tools, metallurgy, welding, and export.

26-2. **Industry at War Prepares for Peace.** *Steel,* v. 114, no. 1, Jan. 3, '44, pp. 195-233.

Steel—the material; steel's production facilities; statistical position of the steel industry; steel's distribution facilities; steel's markets—automobiles, oil, gas, water, shipbuilding, aircraft, construction, machine tools, machinery and equipment, appliances, exports, agriculture, containers, railroads.

26-3. **Concentration of Iron Ores in the United States.** T. B. Counselman. *Mining Technology,* v. 8, no. 1, Jan. '44, Tech. Pub. 1629, 17 pages.

Rates of production, Lake Superior reserves; methods of concentration; results from concentration.

26-4. **Iron Ore Review—1943.** M. D. Harbaugh. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 59-64, 121-123.

A review of the iron ore industry for 1943 in the U. S. and Canada, with output by districts. Tables.

26-5. **The Open Hearth in 1943.** Frank G. Norris. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 73-77.

Brief survey of the open hearth industry for 1943, discussing production, advances and problems. Brief bibliography.

26-6. **1943 Electrical Progress in the Steel Industry.** F. Mohler. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 78-82.

Highlights in the 1943 electrical developments in the steel and aluminum industries.

26-7. **1943—A Year of Remarkable Performance in Production of Open Hearth Steel.** Ralph Vaill. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 68-69.

Advances made in 1943 in the production of open hearth steel. Handling ladle alloys, bath temperature measuring instruments, suspended silica brick main roof, rammed bottoms.

26-8. **Symposium on Technical Progress in the Steel Industry.** *Steel,* v. 114, no. 1, Jan. 3, '44, pp. 270-272, 274,

276, 278, 284, 286-288, 292, 294-295, 297, 298, 300-302, 305-306, 310, 313, 314, 380-398.

Brief reviews of metallurgy, materials handling, joining, welding, steel making, heat treating, finishing, casting, machining, forging.

26-9. **Developments in the Iron and Steel Industry During 1943.** W. H. Burr. *Iron & Steel Engineer,* v. 21, no. 1, Jan. '44, pp. 79-92.

A broad perspective of 1943 in the steel industry brings out two important but anomalous points—the steel industry has produced enough steel, and the program to boost annual steel capacity by 10,000,000 tons has fallen far behind schedule.

26-10. **Annual Engineering Review.** *Metals and Alloys,* v. 19, no. 1, Jan. '44, pp. 67-114.

Covers production of metals, foundry practice, metal working and treating, materials and engineering design, quality inspection and control.

26-11. **The Aluminum Industry.** Philip D. Wilson. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 71-73.

Consumptive demand for war program not so great as forecast, so brakes are being put on production.

26-12. **The Zinc Industry.** Arthur A. Center. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 68-69.

Plenty of zinc for approved uses now available—new plant.

26-13. **The Lead Industry.** Wm. E. Milligan. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 66-67.

Production adequate throughout the year despite war handicaps—importance of scrap emphasized.

26-14. **Magnesium.** Philip D. Wilson. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 74-75.

Production has met all demands but possible new uses may require still further expansion.

26-15. **Rare and Precious Metals.** E. M. Wise. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 78-79.

Many are finding increasing uses, particularly in the electrical and electronics fields.

26-16. **Non-Metallic Minerals.** Oliver Bowles. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 82-88.

Large variety of raw materials and products found of value in war production—domestic deposits developed to replace imports.

26-17. **Iron and Steel Process Metallurgy.** W. O. Philbrook. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 89-92.

Record output attained despite scrap headaches—steel cartridge cases among the new products.

26-18. **Non-Ferrous Physical Metallurgy.** L. W. Kempf. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 104-106.

Brief reports on what the year has brought forth in aluminum, copper, lead, magnesium, nickel, silver, tin and zinc.

26-19. **Ferrous Physical Metallurgy.** Morris Cohen and Stewart G. Fletcher. *Mining & Metallurgy,* v. 25, no. 446, Feb. '44, pp. 93-95.

Closer co-ordination seen between fundamental scientific research and practical problems.

26-20. **Too Many War Plants?** *The United States News*. Feb. 11, '44, p. 22.

Shutdown of some facilities as surpluses of basic materials pile up. Local pressure to keep industries going. Disputes for peacetime in the making.

26-21. **Minerals Flowing.** *Business Week*, no. 753, Feb. 5, '44.

Axis powers monopolized Brazil's mineral riches until the war. Now the Allies are getting them and pushing development.

26-22. **Annual Yearbook and Directory.** *Aviation*, v. 43, Feb. '44.

Aircraft specifications, aircraft engine specifications; directory of aircraft, rotary wing, engine, glider manufacturers, and aviation suppliers, classified.

26-23. **Development of the Mineral Industry in Peace and War.** J. R. Finlay. *Mining & Metallurgy*, v. 25, March '44, pp. 156-162.

What recent history teaches us in making plans for production in the next two decades.

26-24. **Difficult Problems Met in Supplying Raw Material for New Geneva, Utah, Steel Plant.** *Mining & Metallurgy*, v. 25, March '44, p. 169.

Statistical information dealing with total steel capacity, iron ore deposits, furnaces and refractories.

26-25. **The Metal Market After the War.** W. C. Hirsch. *Automotive and Aviation Industries*, v. 90, March 1, '44, pp. 17-18, 56.

Production figures on steel capacity. Finished steel, Al and Mg production.

26-26. **Aluminum Ore and Metal Now Being Stockpiled.** Philip D. Wilson. *Metal Progress*, v. 45, March '44, pp. 473-477.

Official statement of the present situation of aluminum.

26-27. **Postwar Steels Should Conserve Valuable Alloying Elements.** Charles M. Parker. *American Machinist*, v. 88, March 16, '44, pp. 97-100.

With vital steel alloying elements found scattered over the face of the globe we must design weapons using materials available within this continent.

26-28. **China's Infant Heavy Industry.** *Iron Age*, v. 153, March 16, '44, pp. 64-65.

Free China is adapting smelter and furnace designs from the earlier days of American and European iron and steel production. Ferrous and other heavy industry output, while small, has grown swiftly in the past two years.

26-29. **Copper Production Picture for 1943 and 1944.** F. H. Hayes. *Mining Journal*, v. 27, Feb. 29, '44, pp. 5-6.

Although the 1943 copper production was the greatest in the history of the United States, there is a possibility that 1944 copper production may establish another record. This is due to the fact that greater output will come from some of the projects completed in

1943 or to be completed early in 1944, thus more than offsetting decreases expected in some of the operating mines.

26-30. **Progress of the Zinc Industry.** Myron L. Trilsch. *Mining Journal*, v. 27, Feb. 29, '44, pp. 7, 29-30.

The major task confronting the zinc industry in 1944 will be to adjust production to military requirements and essential civilian needs. This will require a decision as to the size of stockpile desirable for national security. The Zinc Division, WPB, proposes two methods for regulating the stockpile: Curtailing domestic mine output, and increasing consumption of zinc by relaxation of restricted uses.

26-31. **Some Major Problems in the Field of Minerals and Metals.** Arthur H. Bunker. *Mining Congress Journal*, v. 30, Feb. '44, pp. 51-55, 97.

Progressive formulation of national mineral policies to meet the requirements of global war; stockpiling and development of mineral reserves for the future.

26-32. **Copper Meeting Essential Requirements.** F. H. Hayes. *Mining Congress Journal*, v. 30, Feb. '44, pp. 56-58.

Domestic production reaches record level and industry is set for a slight increase in 1944, if required.

26-33. **Lead Holds Its Own.** E. Vogelsang. *Mining Congress Journal*, v. 30, Feb. '44, pp. 58-59.

Firm domestic production is indicated to assure supply-demand balance.

26-34. **Current Zinc Outlook.** M. L. Trilsch. *Mining Congress Journal*, v. 30, Feb. '44, pp. 59-61.

Stabilized demand for zinc shifts industry's problem to curtailed production, increased stocks or relaxation of restricted uses.

26-35. **Iron Ore Wins Another Service Stripe.** M. D. Harbaugh. *Mining Congress Journal*, v. 30, Feb. '44, pp. 62-64.

The iron ore industry assures the nation its most basic war material, continues its technologic progress and foresees continued heavy demands.

26-36. **Bauxite Alumina and Aluminum Ingot.** James L. Head. *Mining Congress Journal*, v. 30, Feb. '44, pp. 71-72.

Source, capacity and production, and uses discussed.

26-37. **Magnesium.** Perry D. Helser. *Mining Congress Journal*, v. 30, Feb. '44, pp. 72-73.

1943 production up 275%.

26-38. **The Versatility and Prestige of Silver.** Pat McCarran. *Mining Congress Journal*, v. 30, Feb. '44, pp. 74-77, 102.

Its new war and industrial importance results in unprecedented demand reducing U. S. stocks. Position advances in coming stabilization of world currencies.

26-39. **Gold Mining Hard Hit.** Merrill E. Shoup. *Mining Congress Journal*, v. 30, Feb. '44, pp. 78-81.

With operations suspended by government edict, the industry finds itself between the "devil and the deep blue sea," but looks confidently to a bright future.

26-40. **Antimony Production Ample for Needs.** L. G. Matthews. *Mining Congress Journal,* v. 30, Feb. '44, p. 82.

Supply-demand situation eases, resulting in removal of allocation control and restrictions on Jan. 1, 1944.

26-41. **Quicksilver Meets All Wartime Requirements.** S. H. Williston. *Mining Congress Journal,* v. 30, Feb. '44, p. 83.

Sources and production.

26-42. **Ferro-Alloy Metals.** Frank Hatch. *Mining Congress Journal,* v. 30, Feb. '44, pp. 84-85.

Control of shipping lanes from foreign production sources and drop in projected alloy steel program and threatened shortages.

26-43. **Mercury, Silver and Miscellaneous Minerals.** Richard J. Lund. *Mining Congress Journal,* v. 30, Feb. '44, pp. 86-88, 102.

Production and consumption.

26-44. **A Post-War Mineral Control Policy.** Geo. B. Langford. *Canadian Mining and Metallurgical Bulletin,* no. 383, March '44, pp. 114-138.

Mineral resources; general considerations concerning mineral resources; conservation and utilization of mineral resources; trends in industrial development; cartels in the mineral industry; proposed policy for the mineral industry; need for stabilizing industry.

26-45. **Aluminum at War.** W. C. Devereux. *Metallurgia,* v. 29, Feb. '44, pp. 183-188.

The vital importance of metallic materials in wartime is well known, the quantity of supplies available, and the ability to make the best possible use of them, determine the extent to which a country can wage war, whether in defense or attack. An informative picture of aluminum at war which indicates tremendous possibilities for this material in post-war production in practically every section of industry.

26-46. **The British Aluminum Industry in War-Time.** George Mortimer. *Metallurgia,* v. 29, Feb. '44, pp. 189-197.

How aluminum met the demands of a change from peace to war conditions. The possibilities of the industry when peace returns; after the severe service suitable aluminum alloys have successfully withstood under war conditions, the position of the industry should then be assured.

26-47. **Investigations of Mercury Deposits.** McHenry Mosier. *Mining Technology,* v. 8, March '44, T. P. 1697, 9 pages.

Mercury is one of the strategic metals of which the supply has been raised from critical uncertainty to more than enough for essential demands. Stocks are now adequate, domestic production (currently at the rate of 50,000 flasks per year) is gradually being curtailed through Government control of labor and operating supplies.

26-48. **Domestic Metal Supply Ample to Meet Needs.** *Metals,* v. 14, March '44, pp. 17-20.

MRC stockpiles of lead and zinc grow, but WPB

urges maximum output as safeguard against contingencies.

26-49. **Quicksilver.** Gordon I. Gould. *Mining World,* v. 6, March '44, pp. 23-24.

The domestic quicksilver industry has been disclosed in figures recently made public as having risen to meet the wartime emergency quickly and adequately.

26-50. **Role of the Heavy Metals in the Postwar Economy.** John D. Sullivan. *Mining World,* v. 6, March '44, pp. 32, 34.

Postwar forecast for steel, copper, zinc, lead, and tin.

26-51. **Role of Heavy Metals in Postwar Economy.** John D. Sullivan. *Mining Congress Journal,* v. 30, March '44, pp. 29-34.

Firm postwar position for heavy metals is indicated by past experience, future consumer demands, and available supplies. Technical advances of war period to be reflected in our postwar economy.

26-52. **Control of Mineral Supplies to Preserve Peace—a Symposium.** *Mining and Metallurgy,* v. 25, April '44, pp. 199-207.

Problems of Mineral Sanctions, C. K. Leith. Postwar Control of Axis Al and Mg Industries, Philip D. Wilson. Mineral Sanctions, War and Peace, H. Foster Bain. Canadian Views on Postwar Situation, George C. Bateman. Petroleum as an Instrument for Peace, W. B. Heroy. Role of Steel in Mineral Sanctions, C. K. Leith. Mineral Control—Wise or Unwise?, P. D. Merica. Position of Iron and Steel Industries, Walter S. Tower.

26-53. **Survey of Copper, Lead, and Zinc.** *Mining Journal,* v. 27, April 15, '44, pp. 3-4.

A comprehensive outline of the situation in the copper, lead, and the zinc industries, together with a resumé of the industries' prospects for the coming year.

26-54. **Shall Our Mineral Controls Be Continued After the War?** George B. Langford. *Mining and Metallurgy,* v. 25, May '44, pp. 249-250.

How to conduct the mineral industries of the peace-seeking nations to the fullest advantage of both producers and consumers. The time is past for complete freedom of enterprise with no over-all planning and with unbridled competition.

26-55. **Current Zinc Outlook.** Myron L. Trilsch. *The Mines Magazine,* v. 34, March '44, pp. 116-117.

Review of 1942 and 1943, and 1944 outlook.

26-56. **Restrictive Allocation Relaxed as Tungsten Production Goes Over the Top.** *The Mining Journal,* v. 27, April 30, '44, pp. 3-4.

Alleviation of the tungsten situation since the attack on Pearl Harbor is another of those production miracles which has characterized the nation's war effort and reflects great credit on the resourcefulness of America.

26-57. **Problems of Wartime Metal Output Overcome Largely Through Ingenuity of Metallurgists.** Clyde Williams. *Metals,* v. 14, April '44, pp. 6-8.

In two years we have done a better job of produc-

tion, substitution and conservation than Germans in 10 years.

26-58. **Immediate Post-War Zinc Outlook Not Disturbing if Adequate Stockpiling Legislation Is Enacted.** R. A. Young. *Metals,* v. 14, April '44, pp. 12-15, 21.

Present government policy of reducing import duties on metal makes long-range prospects for industry less encouraging.

26-59. **Zinc Requirements for Current Year Placed at 920,467 Tons; New Supply at 1,066,907 Tons.** M. L. Trilsch. *Metals,* v. 14, April '44, pp. 16-17.

Indicated surplus of 146,440 tons plus surplus stockpile of 155,839 tons would create reserve of 302,279 tons at close of 1944.

26-60. **Lead Carries Its Weight.** Fred P. Peters. *Scientific American,* v. 170, June '44, pp. 250-252.

Some of lead's recent advances and a hint of its post-war prospects.

26-61. **Saving and Substitution of Critical Materials.** (*La Technique Moderne,* v. 35, Sept. '43, pp. 133-136.) *Engineers Digest,* v. 1, May '44, pp. 358-359.

Cement with barium partly taking the place of calcium. Concrete and iron tubes replace cast-iron tubes. Gutters in bakelised wood replace zinc.

26-62. **Stockpiling—Vital to National Security.** Julian D. Conover. *Mining Congress Journal,* v. 30, May '44, pp. 30-33.

Excess supplies of strategic and critical minerals at end of war are NOT surplus property to be disposed of but part of the nation's permanent wealth to safeguard our future security.

26-63. **Molybdenum—Its Applications in the Mining Industry.** Telfer E. Norman. *Mining Congress Journal,* v. 30, May '44, pp. 36-38.

Molybdenum alloy steels find many uses in mining machinery and equipment.

26-64. **U. S. No Longer Self-Sufficient in Zinc Ore; May Have to Import 200,000 Tons a Year.** Thomas H. Miller. *Metals,* v. 14, May '44, pp. 15-16.

Post-war estimated consumption ranges between 650,000 and 850,000 tons; foreign metal will be required to meet needs.

26-65. **Copper Consumption Off in U. S.; Post-War Surplus Scrap Looms as Big Trade Problem.** L. H. Tarring. *Metals,* v. 14, May '44, pp. 15-16.

Little change in tin; lead curbs to continue; zinc supply satisfactory.

26-66. **Four War Years Mark Great Strides in Aircraft Manufacture.** R. A. Trumpis. *American Machinist,* v. 88, June 8, '44, pp. 113-122.

A review of production practices from 1941 to 1944 shows how war requirements were achieved and reflects current trends in the plants of airframe manufacturers.

26-67. **British Iron Ore and Ironstone.** G. V. Standerline. *Mine & Quarry Engineering,* v. 9, May '44, pp. 119-123.

Pre-war output of British ores of 14½ million tons is now well exceeded.

26-68. **We Are Not Have-Nots in Copper, Lead and Zinc.** Evan Just. *Engineering & Mining Journal,* v. 145, June '44, pp. 69-72.

Data are presented to demonstrate that statements which characterize the United States as having reached a have-not status in minerals greatly underrate our true position in regard to copper, lead, and zinc. Charts showing the relationship between prices and production for the past 15 years illustrate the profound effect of prices on production and give a rough idea of our future capacities at various prices.

26-69. **South Dakota Manganese a Reserve for the Future.** E. T. Casler and I. M. Le Baron. *Engineering & Mining Journal,* v. 145, June '44, pp. 73-77.

Results of the research project at Chamberlain, S. D. to find a way of mining, recovering, and storing manganese nodules.

26-70. **War Production Board Reports on Lead Production, Consumption and Stocks.** *Mining Journal,* v. 28, June 30, '44, pp. 4-7.

Effects of the war on lead production, consumption, and stocks. Estimates also are made as to the probable effects of the new Selective Service rulings on mine labor, and a total loss of about 82,000 tons of lead production in the 12-month period ending April, 1945 is predicted.

26-71. **Lead—Past, Present and Future.** Clinton H. Crane. *Metals,* v. 14, June '44, pp. 6-9.

Consumption of lead, lead output of domestic mines, recovery of lead from secondary sources.

26-72. **Role of Heavy Metals in Post-War Economy.** John D. Sullivan. *Mines Magazine,* v. 34 May '44, pp. 207-212, 218.

Iron and steel, steel alloying constituents, copper, zinc, lead, tin.

26-73. **What Are Strategic and Critical Materials?** Elmer W. Pehrson. *Mining and Metallurgy,* v. 25, July '44, pp. 339-341.

A brief review of the history of these terms, and of their present meaning, with some official definitions, as given by a leading member of the Bureau of Mines staff, will assist in an understanding of the current discussion of postwar stock-piling and surplus-disposal problems.

26-74. **The Spanish Metallurgical Industries. III.** *Chemical Age,* v. 50, June 3, '44, pp. 527-528.

Non-ferrous metals. Copper, lead, mercury, gold and silver.

26-75. **The Future of the Aluminum Industry.** W. C. Devereux. *Metallurgia,* v. 30, May '44, pp. 11, 12.

Emphasizes the need for an early statement, by a responsible authority, on the possible postwar reductions in the price of aluminum alloys, and suggests that they could be given in terms of pre-war values.

The vital importance of a large and highly developed aluminum fabricating industry in the country.

26-76. **Lead—Past, Present, and Future.** Clinton H. Crane. *Mining Journal,* v. 28, July 30, '44, pp. 6-7.

Higher lead and zinc prices are predicted for the postwar period when additional tonnages will be needed to meet world markets. The fear of competition from the plastics and the so-called lighter metals is unfounded.

26-77. **An Iron and Steel Industry in the Northwest.** David S. Tait. *Mining World,* July '44, pp. 24, 26.

High quality ore available; charcoal for fuel; cheap power prerequisite.

26-78. **Stockpiling—Vital to National Security.** Julian D. Conover. *Metals,* v. 14, July '44, pp. 6-10.

Costly experience in present war; stockpiles as insurance for future; disrupted effect of dumping; metal stocks are not surplus; immediate access to raw materials; opportunity to create permanent stockpiles; further purchases; legislative proposals.

26-79. **Military Control Over Axis' Supply and Use of Metal in Post-War — Wise or Unwise?** P. D. Merica. *Metals,* v. 14, July '44, pp. 11-13.

Any minerals control program should be limited to the assembling of adequate statistical information; information concerning production, distribution, and consumption of metals and metallic minerals.

26-80. **What to Do About Maggie, the Metal.** Walter A. Janssen. *Metals,* v. 14, July '44, pp. 14-16.

The post-war outlook for magnesium; price rise in last war; production in U. S.; exported in 1928; German production; affinity for oxygen; magnesium vs. aluminum; this war's influence; present production; world's largest producer; potential surplus available.

26-81. **Prerequisites for Future Expansion of Western Steel Fabricating Industries.** J. R. Mahoney. *Western Metals,* v. 2, August '44, pp. 26, 29.

Prewar capacities, construction steels, flat rolled products, postwar operation, strategic position, economic factors.

26-82. **Minerals in War and Peace.** C. K. Leith. American Society for Testing Materials *Bulletin,* no. 129, August '44, pp. 18-20.

Minerals as vital raw materials for industry and for armament and as controversial international problems.

26-83. **Magnesium Destined to Play Important Role in Post-War Economy—New Outlets Envisioned.** *Metals,* v. 15, August '44, pp. 10-13, 26.

Aluminum Co. of America, through its subsidiary, American Magnesium Corp., outlines uses to which metal may be put.

26-84. **The War's Impact on the Mineral Industry of Washington.** Milnor Roberts. *Mining & Metallurgy,* v. 25, Sept. '44, pp. 411-414.

Production increased in 1942 but dropped last year because of man-power shortages.

26-85. **What for Copper After the War?** W. R. Ingalls. *Mining and Metallurgy,* v. 25, Sept. '44, pp. 427-429.

Examination of proportions of old and new copper; post-war domestic demand; present known stocks.

26-86. **Where Is Aluminum in Post-War Era?** Walter Janssen. *Domestic Commerce,* v. 32, August '44, pp. 5-6, 24.

Principal uses by industry in the past and a postwar forecast. 900,000,000 lb. is best estimate of over-all tonnage for post-war demands. This is a little more than one-third of present wartime capacity and a little less than three times the peak peacetime production in 1939.

26-87. **Western Steel, A Riddle of Uncertainties.** *Iron Age,* v. 154, Sept. 7, '44, pp. 60-66.

Geneva plant has now become a symbol of the post-war threat of DPC plants to those which have been built and nurtured by private industry. Being a high cost producer, it can maintain its competitive position only by some form of government subsidy. Appraises Geneva's potentialities.

26-88. **British Iron and Steel.** *Metallurgia,* v. 30, July '44, pp. 135-138, 164.

Fuel, transport, and ore are likely to show much higher costs in the future. Much experimental work is necessary to make the best possible use of the lean ores available in this country, and plant and equipment must be modernized or arrears of repairs and maintenance made up as quickly as possible in the post-war period to facilitate economic production.

26-89. **Research and the Future of the British Iron and Steel Industry.** D. A. Oliver. *Metallurgia,* v. 30, July '44, pp. 139-142.

Research is the systematic exploration of the unknown. Systematic exploration avoids confusion, reduces the possibility of premature conclusions, indicates the often unexpected influence of one factor upon another, and results in the final application of a discovery or a development for the greatest benefit of mankind. It is this research which is the essential basis of industrial progress and which is discussed by the author in its application to the future of the iron and steel industry.

26-90. **Some Aspects which Affect the Future of the British Iron and Steel Industry.** J. Ross. *Metallurgia,* v. 30, July '44, pp. 143-144, 158.

Almost every industry is dependent upon ready supplies of iron and steel in suitable forms and at economic prices. To insure an adequate output, it is essential that Britain should have a well-organized and highly efficient iron and steel industry; to achieve this involves many problems, but steady and persistent work and the proper appreciation of the responsibilities shared by both work-people and managements should enable the industry to meet the needs of the finishing trades, not only for the home market, but to regain and expand vital export trade.

26-91. **Labour and the Future of the Iron and Steel Industry.** John Brown. *Metallurgia,* v. 30, July '44, pp. 145-148.

To achieve success in the development of the iron and steel industry cooperation between workpeople and management is essential. Views of the workpeople.

26-92. **The Nature of Postwar Competition of Western Steel Mills.** J. R. Mahoney. *Western Metals,* v. 2, Sept. '44, pp. 7-8.

Wartime steel requirements; excess capacities; alloy steel; progress toward maturity; postwar adaptations; raw materials basis for development.

26-93. **Lead Production, Imports, Consumption and Stocks.** *Mines Magazine,* v. 34, August '44, pp. 382-385.

Lead stocks; lead imports; domestic primary smelter and refinery output; domestic secondary lead; consumption of lead; premium price plan; production loss through military service.

26-94. **Developments in Arizona Metal Deposits.** Eldred D. Wilson. *Mining Journal,* v. 28, Sept. 15, '44, pp. 7-9.

Recent developments in Arizona's mineral industry contrasted with those existing during World War I, and a series of graphs illustrates the progress made by the industry over a 33-year period. Copper still leads all metals in the state in the value of its production, with gold ranking second.

26-95. **The Western Steel Industry.** J. R. Mahoney. *Iron Age,* v. 154, Sept. 21, '44, pp. 67-73, 166, 168.

Evaluates such economic factors as costs, plant efficiency, price and possible markets. Most logical field for the new western plants is that of exports to China, the Philippine Islands and the Netherland Indies. Revitalization of the Far East would act as a checkmate against the future strength of Japan.

26-96. **Economic Problems of Western Steel Industry.** *Steel,* v. 115, Sept. 25, '44, pp. 100-102, 124, 126, 128.

Conditions which will come to the west in post-war period. Characteristics of industrial pattern will depend upon various complex economic phases. Raw materials, markets and equipment studied as a basis for judgment of future course of western steel industry so greatly expanded during the war.

26-97. **The Future of Western Steel.** Robert C. Elliott. *Western Metals,* v. 2, Oct. '44, pp. 9-14.

Postwar visions of Henry J. Kaiser and Benjamin F. Fairless.

26-98. **Prospective Changes in the Mineral Industry of the West.** J. R. Mahoney. *Western Metals,* v. 2, Oct. '44, pp. 20-22.

Only a few of the new wartime mineral developments have had their full effects, and there remain many new adjustments that will continue the wartime expansion into new fields when the removal of restrictions permits the appropriate postwar adjustments.

26-99. **Tin Conservation.** *Chemical Age,* v. 51, Sept. 2, '44, pp. 231-232.

Economies in the U. S. canning industry. 7 ref.

26-100. **Post-War Domestic Copper Output Will Meet Home Requirements at Adequate Price Levels.** Walter R. Ingalls. *Metals,* v. 15, Sept. '44, pp. 6-9.

Balancing supply and demand will also depend on continuance of 4-cent tariff and "lock-up" of Government-owned stocks.

26-101. **Mercury Poses Difficult Post-War Problems for United States Government and Industry.** *Metals,* v. 15, Sept. '44, pp. 10-12.

Metals reserve stockpile equal to 3 years' peacetime needs. Home consumption expected to decline drastically. Spanish and Italian producers will seek to dominate world markets.

26-102. **Where Is Aluminum in Post-War Era?** Walter A. Jannsen. *Metals,* v. 15, Sept. '44, pp. 13-15.

Output in 1939 was 327,000,000 lb.; by end of 1943 domestic production capacity was 2,100,000,000 lb., 55% of which was vested in government-owned plants, balance private.

26-103. **Trends in Alloy Steels.** A. B. Kinzel. *Metal Progress,* v. 46, Oct. '44, pp. 689-692.

An appraisal of post-war developments based on a close acquaintance with the recent history of alloy shortages, scrap supply, and new steels developed for special ordnance purposes.

26-104. **Metals in Peacetime Products.** *Steel,* v. 115, Oct. 9, '44, pp. 160-163.

Metalworking plants expect to expand use of steel, aluminum, copper and brass and magnesium. Sharp gain likewise is indicated for plastics.

26-105. **Outlook for Magnesium.** *Engineering & Mining Journal,* v. 145, Oct. '44, pp. 102-103.

Plentiful supply of the metal and wide experience in its use during the war portend broad application to postwar civilian purposes.

26-106. **Texas City Tin Smelter Producing 30,000 Tons a Year; Capacity About 80,000 Tons.** Erwin Vogelsang. *Metals,* v. 15, Oct. '44, pp. 6-9.

For domestic industry to continue in postwar, steps will have to be taken soon to assure supply of concentrates.

26-107. **Magnesium—Today and Tomorrow.** Willard H. Dow. *Aluminum & Magnesium,* v. 1, Oct. '44, pp. 18-20, 42-43.

Present status of government controlled magnesium; and postwar plans of magnesium fabricator.

26-108. **What's the Future of Aluminum?** Stanley V. Malcuit. *Aluminum & Magnesium,* v. 1, Oct. '44, pp. 30-33, 45.

The future of aluminum based on lower price, wider field of aluminum knowledge, technical improvements within the industry and greater quantity of metal available.

26-109. **The Past, Present and Future of Magnesium.** Walter A. Janssen. *Die Casting,* v. 2, Nov. '44, pp. 52-57.

Not always well behaved; price rise in last war; German production; magnesium vs. aluminum; early

hesitation to use; this war's influence; present production; world's largest producer; potential surplus available.

26-110. **Industry Cannot Get Along Without Platinum Metals.** Fred E. Carter. *Mining & Metallurgy*, v. 25, Nov. '44, pp. 544-545.

Supply exceedingly small in relation to technical and commercial importance.

26-111. **Some Economic Factors in Metallurgy.** C. B. Snodgrass. *Metal Treatment*, v. 11, Autumn '44, pp. 139-144.

The metallurgical resources of the world tend to be developed, expanded and improved to the fullest extent in wartimes. 13 ref.

26-112. **Mercury Poses Difficult Post-War Problem for United States Government and Industry.** *Metals*, v. 15, Nov. '44, pp. 10-13.

Metals reserve stockpile equal to 3 years' peacetime needs; home consumption expected to decline drastically; Spanish and Italian producers will seek to dominate world markets.

26-113. **Copper and Zinc Restrictions Eased Owing to Ample Supply — Lead Situation Tighter.** *Metals*, v. 15, Nov. '44, pp. 18-20, 28.

Consumers more inventory conscious and eating into reserve except in lead—little change noted in metal consumption.

26-114. **The Raw Material Foundation of Western Industry.** J. R. Mahoney. *Western Metals*, v. 2, Nov. '44, pp. 27, 29.

Activity percentages; agricultural raw materials; industries based on lumber; determining factors; iron ore deposits; aluminum and magnesium; nitrate products; western non-metallics.

26-115. **American Tin Supplies and Wartime Consumption.** Erwin Vogelsang. *Metal Progress*, v. 46, Dec. '44, pp. 1243-1247.

Our dwindling stockpile cannot eke out the emergency if we relax our efforts in conservation and scrap collection.

26-116. **The Light Metals and the Steel Business.** L. S. Hamaker. *Blast Furnace and Steel Plant*, v. 32, Dec. '44, pp. 1463-1464.

Aluminum versus steel post-war outlook; plastic market possibilities.

SECTION XXVII

TECHNICAL BOOKS

of Interest to Metallurgical and Related Fields

27-1. **Review of Iron and Steel Literature.** E. H. McClelland. *Blast Furnace and Steel Plant,* v. 32, no. 1, Jan. '44, pp. 109-112, 120.

List of books and pamphlets on iron and steel published in 1943. No journals included.

27-2. **Ammunition: Its History, Development and Use 1600-1943—.22 BB Cap to 20 Mm. Shell.** Melvin M. Johnson, Jr., and Charles T. Haven. 361 pp. Wm. Morrow and Co., 386 4th Ave., New York; $5.00.

27-3. **Atlas of Isothermal Transformation Diagrams.** 104 pp., illus. U. S. Steel Corp., 436 Seventh Ave., Pittsburgh, Pa.; free.

27-4. **Laboratory Manual of Spot Tests.** Fritz Feigl. 276 pp. illus. Academic Press; $3.90.

27-5. **Maintenance Arc Welder.** A. F. Davis and Ed C. Powers. 234 pp., illus. James F. Lincoln Arc Welding Foundation, 12818 Coit Rd., Cleveland, Ohio; 50c.

27-6. **Steel in Action: Science for War and Peace Series.** Charles M. Parker. 221 pp., illus. Jacques Cattell, N. Queen St. and McGovern Ave., Lancaster, Pa.; $2.50.

27-7. **Review of Iron and Steel Literature.** E. H. McClelland. *Steel Processing,* v. 30, no. 1, Jan. '44, pp. 36-40.

The 27th annual review of iron and steel literature, published in 1943.

27-8. **The Welding Encyclopedia.** Completely Revised and Re-Edited by T. B. Jefferson. Eleventh Edition, 1943. The Welding Engineer Publishing Co., 506 S. Wabash Ave., Chicago, Ill.

27-9. **Precision Measurement in the Metal Working Industry.** Prepared by Department of Education of International Business Machines Corp. 263 pp., illus. *Syracuse University Press,* Syracuse, N. Y.; $2.75.

27-10. **Plastics Catalog: The 1944 Encyclopedia of Plastics.** 990 pp., illus. Plastics Catalogue Publishing Co., New York City; $6.00.

27-12. **Ferrous Metallurgy: Volume II. The Manufacture and Fabrication of Steel.** 2nd Ed. Ernest J. Teichert. 487 pp., illus. McGraw-Hill Book Co., Inc., New York, N. Y.; $4.00.

27-13. **Ferrous Metallurgy: Volume I. Introduction to Ferrous Metallurgy.** 2nd Ed. Ernest J. Teichert. 484 pp., illus. McGraw-Hill Book Co., Inc., New York, N. Y.; $4.00.

27-14. **The Practical Design of Welded Steel Structures.** H. Malcolm Priest. 150 pp., illus. American Welding Society, 33 W. 39th St., New York 18, N. Y.; $1.00.

27-16. **Magnesium.** Lilian Holmes Strack. Harper & Bros., New York. $1.00.

27-18. **Successful Soldering.** Louie S. Taylor. 1st ed. McGraw-Hill Book Co., New York. $0.80.

27-19. **Quin's Metal Handbook and Statistics,** 1941-1942. Metal Information Bureau, Ltd., London. 10s.

27-21. **Tungsten.** K. C. Li and C. Y. Wang. Reinhold Publishing Co., New York. $7.00.

27-22. **Materials and Processes.** J. F. Young. 628 pp., illus., John Wiley & Sons, Inc., New York. $5.00.

The selection and use of materials in design engineering, including an analysis of forging, casting and heat treating.

27-23. **Plastic Working of Metals and Non-Metallic Materials in Presses.** E. V. Crane. 3rd ed., 540 pp., illus., John Wiley & Sons, Inc., New York. $5.00.

How and why plastics and metals move and are moved. Planning operations, dies and molds, illustrations of tools, equipment and methods.

27-24. **Aircraft Production Illustration.** George Tharratt. 201 pp., illus., McGraw-Hill Book Co., New York. $3.50.

A manual of perspective layout and technical sketching. It explains the system of making simple three-dimensional pictures for the purpose of interpreting engineering drawings to assembly-line workers who are not capable of reading blueprints. The book includes a brief account of the development of this technique and an explanation of its value in systematizing and speeding production.

27-25. **Blueprint Reading; Understanding Shop Practices.** Fred Nicholson and Fred Jones. 141 pp., illus., D. Van Nostrand Co., New York. $2.25.

For most lessons in this book, the student has before him pictorial illustrations of a machine tool, an expository text on its uses, a reproduction of a blueprint requiring the use of the tool, and questions pertaining to the blueprint. An introductory textbook for classroom use, but useful also for self-instruction.

27-26. **Electron-Optics.** Paul Hatschek; translated by Arthur Palme. 161 pp., illus., American Photographic Publishing Co., Boston. $3.00.

A non-mathematical discussion of electrons and electron beams, their production, refraction and application in such devices as television tubes. The German original was published in 1937. The electron microscope and other recent applications are treated briefly in a final chapter by the translator.

27-27. **Handbook on Designing for Quantity Production.** Herbert Chase. 517 pp., illus., McGraw-Hill Book Co., New York. $5.00.

Technical data and practical "know-how" on the design of parts for economical production by the important processes for quantity production such as die casting, sand casting, forging, plastic molding, together with discussions of the factors to be considered in choosing among the various processes.

27-28. **Materials Handbook.** George S. Brady. 5th ed., 765 pp., McGraw-Hill Book Co., New York. $5.00.

An encyclopedia for purchasing agents, engineers, executives, and foremen. 150 new materials added since previous edition. Appendix contains new tables, lists of terms, and series of maps showing world production areas.

27-29. **Aircraft Sheet Metal Work.** C. A. LeMaster. 387 pp., illus., American Technical Society, Chicago. $3.75.

How to do blueprint reading, template layout, patterns for bends, riveting, soldering, brazing, welding, drop hammer work.

27-31. **Practical Metallurgy for Engineers.** Research Staff of E. F. Houghton & Co. 4th ed., 479 pp., illus., Houghton Press, Philadelphia. $3.00.

27-32. **Guide to Weldability of Steels.** 90 pp., tables and charts, American Welding Society, 33 West 39th St., New York 18, N. Y. $1.00.

In two parts: Part I is designed to be an explanation of the system proposed for the predetermination and preservation of desired ductility in the heated zone of higher carbon and low alloy steels during welding. Part II is an instruction manual, with step-by-step examples showing the use of the system to select steels and to predict welding conditions necessary for the preservation of desired ductility in the heated zone.

27-34. **A Steel Man in India.** John L. Keenan. Duell, New York. $2.50.

27-35. **Polishing and Lapping.** H. L. Ness. The Author, 3332 Nicollet Ave., Minneapolis 8, Minn. $7.50.

27-36. **Year Book of the American Iron and Steel Institute 1943.** 367 pp., *American Iron and Steel Institute*, 350 Fifth Ave., New York 1, N. Y.

Proceedings of 52nd General Meeting. Address of the President, W. S. Tower; addresses by Vice-Admiral S. M. Robinson and Major General L. H. Campbell, Jr. Reports on The Expansion Program and General Production Problems, Steelmaking Practices, Conservation of Critical Materials, Industrial Relations.

27-37. **Recommended Practices for the Sand Casting of Non-Ferrous Alloys.** 159 pp., illus. American Foundrymen's Association, 222 West Adams St., Chicago 6, Ill. $3.00.

Compiled by the Recommended Practices Committee, Brass and Bronze Division, and Committee on Sand Castings, Aluminum and Magnesium Division, American Foundrymen's Association. Covers molding, melting and pouring, finishing, heat treatment, defects—their causes and remedies—properties and applications of various copper-base, aluminum-base and magnesium-base alloys.

27-38. **Alloy Cast Iron Handbook.** 2nd ed., 282 pp., illus., American Foundrymen's Association, 222 West Adams St., Chicago 6, Ill. $3.25.

Reviewed and revised by Alloy Cast Irons Committee, Gray Iron Division, A.F.A. Metallurgical principles; effect of alloys on physical and mechanical properties; ladle inoculants; white and chilled alloy cast iron; heat treatment; foundry practice; specific applications.

27-39. **Chemical Machinery.** E. Raymond Reigel. 579 pp., 400 illus. Reinhold Publishing Co., New York. $5.00.

Presents details of construction, operating technique, capacity, and, where possible, price of all leading types of process equipment.

27-40. **The Oxy-Acetylene Handbook.** 600 pp., The Linde Air Products Co., 50 East 42nd St., New York, N. Y. $1.50.

Covers the entire range of the oxy-acetylene process, giving clear, easy-to-follow instructions for handling all the common commercial metals, together with simple explanations of the fundamental principles of the various methods of depositing and controlling molten metal. Explains operating principles of oxy-acetylene equipment and instructions for its care and maintenance. A how-to-do-it book.

27-41. **Essentials of Precision Inspection.** Wesley Mollard. McGraw-Hill Whittlesey Practical Manual, 207 pp., illus., McGraw-Hill Book Co., 330 W. 42nd St., New York 18. $3.00.

Tells the beginner everything about the inspector's job he should know before taking up work in this field, from the purpose, use, and care of instruments and precision tools, to procedure, terms, materials, and efficient methods of work. Fifty-four practical problems cover every phase of inspection likely to be encountered today.

27-42. **Infrared Spectroscopy.** R. Bowling Barnes, Robert C. Gore, Urner Liddel and Van Zandt Williams. 236 pp., illus., Reinhold Publishing Co., 330 W. 42nd St., New York 18, N. Y. $2.25.

Industrial applications and a bibliography of infrared spectroscopy.

27-43. **Plastics for Industrial Use.** John Sasso. 229 pp., illus., McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. $2.50.

An engineering handbook of materials and methods.

27-44. **Classified Directory.** Eighth Edition, Association of Consulting Chemists and Chemical Engineers, Inc., 50 East 41st St., New York 17, N. Y. Free.

Classification of Consultants. Lists addresses, staffs, scope and activities.

27-45. **The Standardization of Volumetric Solutions.** R. B. Bradstreet. Second Edition, revised and enlarged. Chemical Publishing Co., Inc., 26 Court St., Dept. MC, Brooklyn 2, N. Y. $3.75.

A reference book for analytical chemists and laboratory technicians. Most modern methods of standardization; equations, tables of pertinent data.

27-47. **Conservation in the United States.** Axel Ferdinand Gustafson and others. 2nd ed., 488 pp., illus. Comstock Publishing Co., Ithaca, New York. $4.00.

This new edition stresses the fact that now, in wartime, there is an especial need to conserve the nation's natural resources.

27-48. **Die Differential und Integralgleichungen der Mechanik und Physik.** Philipp Frank and Richard v. Mises. 2 v., 2nd ed., 2020 pp., illus. Mary S. Rosenberg, 235 W. 108th St., New York 25. $27.50.

27-49. **Measurements in Electrical Engineering.** Roland Bartel Marshall. 2 v. 190 pp. and 165 pp., illus. John S. Swift Co., Cincinnati, Ohio. $3.00 ea.

27-50. **Pocket Manual of Arc Welding; Data and Information for the Arc Welding Operator and Supervisor.** Clayton B. Herrick. 128 pp., illus. Industrial Publishing Co., Caxton Bldg., Cleveland, Ohio. $0.50.

27-51. **Pictorial Guide to Machine Shop Practice.** H. Grisbrook and C. Phillipson. 91 pp., illus. Emerson Books, New York. $1.50.

A manual of machine shop fundamentals, illustrated with drawings of the right and wrong ways of using tools.

27-52. **Modern Electric and Gas Refrigeration.** Andrew Daniel Althouse and Carl H. Turnquist. 4th ed., 858 pp.. illus. Goodheart-Wilcox Co., Chicago. $5.00.

27-53. **Mill and Factory Book of Tool Care.** Carl C. Harrington. 243 pp., illus. Duell, Sloan & Pearce, New York. $1.00.

27-54. **Elementary Principles of Diesel-Engine Construction.** By members of teaching staff, Mechanics' Institute and Boys' Technical High School. Rev. ed., 149 pp., illus. Bruce, Milwaukee, $2.00.

A revision, bringing the technical material and illustrations up to present design and practices.

27-55. **Conveyors and Related Equipment.** Wilbur G. Hudson. 346 pp., illus. John Wiley & Sons, Inc., New York. $5.00.

A general description of elevators, conveyors, hoists, crushers and other methods of material handling for student engineers, architects and plant engineers.

27-56. **Control of Electric Motors.** Paisley Beach Harwood. 2nd ed., 486 pp., illus. John Wiley & Sons, Inc., New York. $5.00.

The text and illustrations have been revised, the arrangement radically changed, some new tables included, and chapters on synchronous motor control and variable-voltage control added.

27-57. **Basic Airplane Mechanics.** Hubert G. Lesley. 411 pp., illus. John Wiley and Sons, Inc., New York. $2.50.

A simple explanation of the theory of airplane construction, and directions for repair and maintenance of airplane parts.

27-58. **Aircraft Mechanic's Pocket Manual.** Joseph A. Ashkouti. 3rd rev. ed.; latest AN parts. Pitman Publishing Co., New York. $1.50.

New sections include stress fundamentals for structural repairs and processes for fabrication of plastic materials.

27-59. **Principles of Powder Metallurgy.** (Tr. from the German by Marion Lee Taylor) Franz Skaupy. 80 pp., illus., Philosophical Library, New York. $3.00.

A description of the process of caking or cohesion by which metal powder is changed into compact metal shapes.

27-60. **The Metallography of Meteoric Iron.** Stuart H. Perry. 213 pp., illus., (U. S. Natl. Mus. Bull. 184) '44, Smithsonian Institute, Washington, D. C. Paper $.60.

27-61. **Mineral Resources of Minnesota.** William H. Emmons and Frank K. Crout. 149 pp., maps. (Minnesota Geological Survey Serial.) University of Minnesota Press, Minneapolis. $1.00.

27-62. **The Craftsman Prepares to Teach.** David Frederick Jackey and Melvin L. Barlow. 192 pp. (2p. bibl.) Macmillan, New York, $2.00.

To assist those from industry who are now being called upon to train workers and who have never before had experience in teaching.

27-63. **Composite Aircraft Manufacture and Inspection.** Leno C. Michelon. 558 pp., illus., Harper, New York, $6.00.

A discussion of the basic materials from which composite aircraft are produced, with their Army-Navy Aeronautical Specifications, the processes of manufacture, and inspection instruments and methods. Certain chapters were written with the collaboration of 2nd Lieutenant Raymond J. Devereaux.

27-64. **Kurzgefasstes Handbuch aller Legierungen.** Ernst Janecke. 505 pp., illus., J. W. Edwards, Ann Arbor, Mich. $13.15.

27-65. **The Physical Chemistry of Electrolytic Solutions.** Herbert S. Harned and Benton B. Owen. 611 pp., diag., American Chemical Society Monograph Series, Reinhold Publishing Co., New York City. $10.00.

27-66. **Manual of A.S.T.M. Standards on Refractory Materials.** Prepared by A.S.T.M. Committee C-8 on Refractories. 201 pp., illus., American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa. Heavy paper cover $1.50; cloth $1.75.

Specifications, classifications, methods of testing, definitions, standard samples, industrial surveys, procedure for calculating heat losses. Includes new standards for air setting refractory mortars, fireclay plastic refractories both for boiler and incinerator services, methods of test for measuring the shrinkage, spalling, and workability index of fireclay plastic refractories, and a method for measuring the thermal conductivity of insulating firebrick.

27-67. **Marine Pipefitting.** Vern E. Hase and Ralph W. Allen. 325 pp., illus., McGraw-Hill Book Co., New York. $3.00.

Describes and pictures all major piping systems on ships and the best methods of installing them. Modern shop practice in pipefitting is clearly set forth, with detailed explanation of how to bend pipe, and with a new and practical approach to mechanical and mathematical piping layout.

27-68. **Mathematical and Physical Principles of Engineering Analysis.** Walter C. Johnson. 346 pp., illus., McGraw-Hill Book Co., New York. $3.00.

Presents the essential physical and mathematical principles and methods of attack that underlie the analysis of many practical engineering problems. Emphasis is placed upon physical concepts, the use of assumptions, procedures in setting up equations, use of mathematics as a tool in accurate and quantitative reasoning, and the physical interpretation of mathematical results.

27-69. **Hackh-Grant Chemical Dictionary.** Julius Grant. 3rd Ed., 925 pp., illus., The Blakiston Co., 1012 Walnut St., Philadelphia 5, Pa. $12.00.

Provides concise definitions based on latest research findings, clear account of theories, rules and laws of chemistry; describes elements, compounds, drugs, minerals, etc.; lists reactions processes and methods; mentions chemical apparatus, equipment and instruments.

27-70. **Wear—A Discussion of the Mechanism of Wear Phenomena and Influencing Factors.** D. Landau. 46 pp., illus., The Nitralloy Corp., 230 Park Ave., New York 17. Free.

The mechanism of wear; wear and physical properties; molecular adhesion; surface melting; specific pressures; lubricants and wear; galling; scoring, fretting; gear pitting; work hardening; chemical effects; wear in; wear out; wear of Nitralloy vs. other steels; surface finish and wear.

27-71. **Experimental Stress Analysis, Vol. I, No. 2.** Addison-Wesley Press, Inc., 517 Kendall Square Bldg., Cambridge 42, Mass. $4.00.

A compilation of papers given at the Conference on Experimental Stress Analysis in New York in December, 1943.

27-72. **Mechanical Properties of Metals and Alloys.** Staff of National Bureau of Standards. Circular C 447, 480 pp., Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. $1.50.

Summary of results of a comprehensive survey of the technical literature on strength and related properties, thermal expansion, and thermal and electrical conductivities of ferrous and non-ferrous metals and alloys at normal, high and low temperatures. 4172 metals and alloys listed.

27-73. **The Law of Copyright and Literary Property With Forms.** Horace G. Ball. Over 1000 pp. Matthew Bender and Company, Inc., 109 State St., Albany 1, N. Y. $22.50.

Deals with basic matters, fair dealing, common law, originality, procedure, forms, rules, and acts, words and phrases, interpretations, and various related subjects.

27-74. **Modern Operational Mathematics in Engineering.** Ruel Vance Churchill. 316 pp., diagrs. McGraw-Hill Book Co., 330 W. 42nd St. New York. $3.50.

An introductory treatment of Fourier series and their application.

27-75. **Chemical Engineering Thermodynamics.** Barnett F. Dodge. 698 pp., diagrs. Chemical Engineering Series, McGraw-Hill Book Co., 330 W. 42nd St., New York $6.00.

A textbook primarily for graduate students but also useful as an undergraduate text in the laws of thermodynamics and their application to chemical engineering.

27-76. **Experimental Spectroscopy.** Ralph A. Sawyer. 331 pp., illus., diagrs., Prentice-Hall, New York. $5.00; textbook edited $3.75.

A discussion of prism and grating spectrographs, and the techniques of their use in research.

27-77. **Planers.** Emanuele Stieri. 216 pp., illus., diagrs. Duell, Sloan & Pierce, New York. $1.50.

Descriptions of the general construction of the planer, its driving and feed mechanisms, all necessary adjustments and the various types of cutting tools employed for all planer operations.

27-78. **Machine Drawing Problems.** Edward Berg and George Elleson. Rev. ed., 150 pp., illus., diagrs., Manual Arts Press, Peoria, Ill. $1.96; paper $1.24.

27-79. **Der Warme—und Kalteschutz in der Industrie.** Josef Sebastian Cammerer. 2nd Ed. 322 pp. illus., J. W. Edwards, Ann Arbor, Mich.

27-80. **Die Prufung der Metallischen Werkstoffe.** 760 pp., illus., (Handbuch der Werkstoffprufung, v. 2) J. W. Edwards, Ann Arbor, Mich. $24.20.

27-81. **Pruf — und Messeinrichtungen.** Erich Siebel. 672 pp. illus., (Handbuch der Werkstoffprufung, v. 1), J. W. Edwards, Ann Arbor, Mich. $23.00.

27-82. **Chemische Physik der Metalle und Legierungen.** Ulrich Dehlinger. 185 pp. illus., J. W. Edwards, Ann Arbor, Mich. $4.25.

27-83. **Stanzereitechnik; v. 1, Schneidende Wekzeuge; 2nd ed.** Heinrich Hilbert. 312 pp., illus. J. W. Edwards, Ann Arbor, Mich. $7.15.

27-84. **Prufung und Bewertung elektrotechnischer Isolierstaffe.** Rudolf Nitsche. 336 pp., illus. J. W. Edwards, Ann Arbor, Mich. $7.55.

27-85. **Grundlagen und Kennlinien der Elektronenrohren.** Horst Rothe. 406 pp., illus., (Bucherei der Hochfrequenztechnik, v. 2), J. W. Edwards, Ann Arbor, Mich. $9.50.

27-86. **Die technische Physik der elektrischen Kontakte.** Ragnar Holm. 347 pp., illus., J. W. Edwards, Ann Arbor, Mich. $9.00.

27-87. **Plastische Eigenschaften von Kristallen und Metallischen Werkstoffen.** Albert Kochendorfer. 323 pp., illus., J. W. Edwards, Ann Arbor, Mich. $9.30.

27-88. **Belastungsglieder, Formeln und Zahlentafeln fur Querkrafte, Momente und Belastungsglieder; 5th ed.** Adolf Kleinvogel. 127 pp., illus., J. W. Edwards, Ann Arbor, Mich. $4.00.

27-89. **Gitteraufbau Metallischer Systeme.** Uhlrich Dehlinger. 533 pp., illus., (Handbuch der Metallphysik, 1; pt. 1) J. W. Edwards, Ann Arbor, Mich. $13.75.

27-90. **Grundlagen und Mathematische Hilfsmittel der Hochfrequenztechnik.** Hans Georg Moller. 304 pp., illus., (Lehrbuch der Drahtlosen Nachrichtentechnik, v. 1) '44, J. W. Edwards, Ann Arbor, Mich. $8.20.

27-91. **Spanlose Formung der Metalle.** G. Sachs. 288 pp. illus., (Handbuch der Metallphysik, 3; pt. 1) J. W. Edwards, Ann Arbor, Mich. $8.45.

27-92. **Thermodynamik Metallischer Mehrstoffsysteme.** Karl W. Wagner. 360 pp., illus., (Handbuch der Metallphysik, 1; pt. 2.) J. W. Edwards, Ann Arbor, Mich. $10.55.

27-94. **The Liquidation of War Production.** A. D. H. Kaplan. 133 pp., McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. $1.50.

A research study by Committee for Economic Development. Surveys the problems of cancellation of war contracts and disposal of government-owned plants and surpluses, and suggests definite policies and methods of solution.

27-95. **Studies in Arc Welding.** 1200 pp. James F. Lincoln Arc Welding Foundation, Machinery Publ. Co., Ltd., 17, Marine Parade, Brighton. Price 15s.

27-96. **Maintenance Arc Welding.** 234 pp. James F. Lincoln Arc Welding Foundation, Machinery Publication Co., Ltd., 17 Marine Parade, Brighton, England. Price 6s, 0d. net.

27-97. **Elektrische Hochstspannungen.** Albert Bouwers. 342 pp., illus. (Technische Physik. v. 1). J. W. Edwards, Ann Arbor, Mich. $9.00.

27-98. **Die Metallverflüchtigungsverfahren mit besonderer Berücksichtigung der Herstellung von Zinkoxyd.** Otto Barth. 262 pp., illus. (Metallhüttenpraxis in Einzeldarstellungen, v. 4.) J. W. Edwards, Ann Arbor, Mich. $5.40.

27-99. **Air Conditioning and Refrigeration; 2nd ed.** Burgess Hill Jennings and Samuel Richard Lewis. 533 pp., illus. International Textbook Co., Scranton, Pa. $4.50.

Revised to conform to new practices in air conditioning. The text has also been expanded in the field of refrigeration.

27-100. **The Application of Radiant Heat to Metal Finishing.** J. H. Nelson and H. Silman. 79 pp. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C. 2, England. Price 8s. 6d. net.

27-101. **The Technology of Magnesium and Its Alloys.** Adolf Beck. 511 pp. Translated from German by Technical Staffs of F. A. Hughes & Co., Ltd., and Magnesium Elektron, Ltd. Price 30s. net.

27-102. **Photomicrography, in Theory and Practice.** Charles Patten Shillaber. 781 pp., illus. John Wiley & Sons, New York. $11.00.

A reference book on the theoretical and practical aspects of using the camera with the microscope. Microscope construction and operation; cameras and photographic technique, staining and mounting technique; glossary of optical terms.

27-103. **Jigs, Tools & Fixtures.** Philip Gates. 209 pp. Technical Press, Gloucester Road, Kingston Hill, Surrey, England. Price 14s. 0d. net.

27-104. **Jig and Fixture Practice.** H. C. Town. 113 pp., Paul Elek, Ltd., Africa House, Kingsway, London, W. C. 2, England. Price 10s 6d. net.

27-105. **The Practical Sheet Metal Worker.** Edited by J. S. Murphy. 164 pp. Odhams Press, Ltd., Long Acre, London, England. Price 8s. 6d. net.

27-106. **Plastic Horizons.** Benjamin Henry Weil and Victor John Anhorn. 178 pp., illus. (Science for War and Peace Series.) Jaques Cattell, Lancaster, Pa. $2.50.

27-107. **SAE Handbook, 1944 Edition.** 636 pp., Society of Automotive Engineers, 29 West 39th St., New York 18, N. Y. $5.00.

Standards, specifications and classifications. Reflects wartime industrial and technical progress in developing new methods and materials.

27-108. **Seamless Steel Tube Data.** 320 pp., looseleaf binder. Seamless Steel Tube Institute, Pittsburgh 19, Pa. $2.50.

General data on history, manufacture, tests, special shapes and standard steels. Uses, sizes and tolerances and standard specifications for mechanical tubing. Pressure tubing including boiler tubes, heat exchanger and condenser tubing, still tubes, alloy steel pipe, stainless steel analyses. Reference tables.

27-109. **Basic Structures.** F. R. Shanley. 392 pp., illus., John Wiley and Sons, New York. $4.50.

Forces and moments, force transmission, truss analysis, shear webs, torsion, combined shear and torsion, combined stress, etc. Presented with special reference to aeronautics. Appendix includes tables and diagrams relating to properties of materials under various conditions of stress and strain.

27-110. **Colorimetric Determination of Traces of Metals.** B. E. Sandell. 487 pp., illus. Interscience Publishing Co., New York. $7.00.

Methods for separation and isolation, and description of colorimetric reagents employed. Techniques used in determining traces of 47 different metals. Extensive bibliography.

27-111. **Arc and Acetylene Welding.** Harry Kerwin. 240 pp., illus. McGraw-Hill Book Co., 330 West 42nd St., New York. $2.50.

A well-organized introductory text. Directions and discussions are given for 41 lessons or shop exercises covering as many types of welding jobs and problems.

27-112. **Schweisskostruktionen; Grundlagen der Herstellung, der Berechnung und Gestaltung; ausgefuhrte Konstrucktionen.** R. Hänchen. 123 pp., illus. J. W. Edwards, Ann Arbor, Mich. $4.15.

27-113. **Schweisstechnik im Flugzeugbau; 2nd ed.** Kurt Queitsch. 160 pp., illus. J. W. Edwards, Ann Arbor, Mich. $6.55.

27-114. **Komplexe Zahlen und Zeiger in der Wechselstromlehre.** Max Landolt. 185 pp., illus. J. W. Edwards, Ann Arbor, Mich. $5.50.

27-115. **Kerbspannungslehre.** Heinz Neuber. 160 pp., illus. J. W. Edwards, Ann Arbor, Mich. $4.00.

27-116. **Moderne Eisentherapie.** Rudolf Stodtmeister and Peter Buchmann. 120 pp., illus. J. W. Edwards, Ann Arbor, Mich. $3.75.

27-117. **Industrial Research Service's Conversion Factors and Tables.** O. T. Zimmerman and Irvin Lavine. 262 pp., illus., Industrial Research Service, Dover, N. H. $2.75.

Features a 200-page table of conversion factors for the changing of scientific and commercial units from one system of measurement to another. This table is arranged alphabetically by name of unit, and gives the multipliers for about 6500 conversions, ranging from familiar ones such as inches to centimeters to unfamiliar ones such as Maxwells to Webers.

27-118. **Thermodynamic Charts.** Frank O. Ellenwood and Charles O. Mackey. 2nd ed., 46 pp., John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $2.75.

"Vapor Charts", including new charts for steam and water mixtures; tables of jet velocities for the turbine designer; psychrometric charts for the air conditioner; charts of properties of ammonia and freon for the refrigerator.

27-119. **Centrifugal Pumps and Blowers.** Austin H. Church. 307 pp., illus., John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $4.50.

Time-tested materials and methods plus basic information needed to understand and apply new theories. Contains sufficient information to completely design a pump and blower.

27-120. **The System of Mineralogy.** James Dwight Dana and Edward Salisbury Dana. 7th ed., v. 1, Elements, Sulfides, Sulfosalts, Oxides. 847 pp., illus. (37 pp. bibl. and bibl. footnotes). John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $10.00.

Originally published in 1844, this volume has been entirely rewritten and greatly enlarged by Charles Palache, Harry Berman and Clifford Frondel. It is planned to publish the remaining two volumes as soon after the war as possible.

27-121. **Practical Design for Arc Welding; v. 1.** Robert E. Kinkead. Hobart Brothers, Hobart Square, Troy, Ohio. $3.50.

A series of designs for arc welding illustrated with plates and graph paper for each plate. Symbols, joints and sections for welding are also listed.

27-122. **Turret Lathes.** Emanuele Stieri. 211 pp., illus., Duell, Sloan & Pearce, New York. $1.50.

Descriptions of the various types of turret lathes and an explanation, in simple language, of their operation.

27-123. **Drill Presses.** Emanuele Stieri. 216 pp., illus., Duell, Sloan & Pearce, New York. $1.50.

An explanation of the design and operation of drill presses, specific jobs of drilling and practical details of the process in modern plants, with many tables.

27-124. **The Engine Lathe.** Emanuele Stieri. 308 pp., illus. Duell, Sloan & Pearce, New York. $1.50.

Drawings and descriptions of the operations of an engine lathe.

27-125. **Werkstoffkunde der Hochvakuumtechnik.** W. Espe and M. Knoll. 386 pp., illus., bibl. J. W. Edwards, Ann Arbor, Mich. $15.75.

27-126. **Technologie der Zinklegierungen.** Arthur Burkhardt. 2nd ed., 324 pp., illus., bibl. J. W. Edwards, Ann Arbor, Mich. $10.65.

27-127. **Analysis of Drill Jig Design.** J. I. Karash. 325 pp., illus. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. $3.00.

An analytical, factual, systematic approach to the problems of tool design, using drill jigs as a specific case study and outlining fundamental principles and methods that apply in varied degree to all tool design problems.

27-128. **Electronics: Today and Tomorrow.** John Mills. 178 pp. D. Van Nostrand & Co., New York. $2.25.

27-129. **Theoretical Chemistry.** Samuel Glasstone. 515 pp., illus. D. Van Nostrand Co., New York. $5.00.

27-130. **Aircraft Sheet Metal Blueprint Reading.** Harry H. Coxen and others. 132 pp., illus., paper, spiral binding. American Technical Society. $2.50.

A series of questions and answers based upon separate folding blueprints making blueprint reading understandable and easy to follow. The first section of the book explains blueprint reading technique.

27-131. **A Shorter History of Science.** Sir William Cecil Dampier. 199 pp., illus. Macmillan, New York. $2.00.

The story of the advances made in all the physical sciences during each age, beginning with Greece and continuing to the present day.

27-132. **Plating and Finishing Guidebook.** 1944 edition. Metal Industry Publishing Co., 11 W. 42nd St., New York. $1.00.

27-133. **Direct-Current Circuits.** Earle M. Morecock. 405 pp., illus. (Rochester Technical Series.) Harper Brothers, New York. $3.25.

This textbook in electricity has been written in order to develop teaching materials which are functional and closely related to the requirements of industry.

27-134. **Laying out for Boiler Makers and Plate Fabricators;** Revised by George M. Davies. 5th ed., 526 pp., illus. Simmons-Boardman, New York. $7.00.

Chapters on the locomotive boiler have been expanded, and two new chapters on laying out and computing boiler patches and on laying out for welded construction have been added.

27-135. **The Engineer in the Post-War World.** 88 pp., paper, Research Bureau for Post-War Economics, 90 Morningside Dr., New York 27, N. Y. $2.00.

Speeches and addresses delivered at the Public Conference held in New York on March 4, 1944.

27-136. **Ultra-High Frequency Radio Engineering.** W. L. Emery. 305 pp., illus. Macmillan, New York. $3.25.

Developed from a series of lectures to the Electronic Teachers' Conference which was held at M.I.T. in the fall of 1941, this is a textbook for senior electrical engineering students.

27-137. **Die Wechselfestigkeit metallischer Werkstoffe; ihre Bestimmung und Anwendung.** Wilfried Harold. 276 pp., illus. J. W. Edwards, Ann Arbor, Mich. $7.25.

27-138. **Elektrische Messgerate und Messeinrichtungen.** Albert Palm. 231 pp., illus. J. W. Edwards, Ann Arbor, Mich. $5.50.

27-139. **Geogossene Metalle und Legierungen; Grundlagen der Metallgiessereitechnischen Werkstoffkunde.** Willi Claus and A. H. F. Goederitz. 345 pp., illus. J. W. Edwards, Ann Arbor, Mich. $13.50.

27-140. **Grundlagen der Photochemie.** Karl Fredrich Bonhöffer and P. Harteck. 295 pp., illus. (Chemische Reaktion, v. 1.) J. W. Edwards, Ann Arbor, Mich. $6.75.

27-141. **Grundlagen der Metallkunde.** George Masing. 127 pp., illus. J. W. Edwards, Ann Arbor, Mich. $3.85.

27-142. **Handbuch der Spritzgusstechnik der Metallegierungen einschliesslich des Warmpressgussverfahrens.**

Leopold Frommer. 686 pp., illus. J. W. Edwards, Ann Arbor, Mich. $16.50.

27-143. **Hochspannungs-Praktikum.** Erwin Marx. 238 pp., illus. J. W. Edwards, Ann Arbor, Mich. $6.00.

27-144. **Passung und Gestaltung (ISA-Passungen).** Paul Leinweber. 240 pp., illus. J. W. Edwards, Ann Arbor, Mich. $5.00.

27-145. **Warmetechnische Rechnungen fur Industrieöfen.** Werner Heiligenstadt. 2nd ed., 340 pp., J. W. Edwards, Ann Arbor, Mich. $6.75.

27-146. **Meet the Electron.** David Grimes. 127 pp. illus., Pitman, New York. $2.00.

A simplified statement of the theory of electronics, for the layman who wants to know just what makes his electrical appliances work.

27-147. **Sampling Inspection Tables; Single and Double Sampling.** Harold F. Dodge and Harry G. Romig. 112 pp. John Wiley and Sons, New York. $1.50.

These tables were developed for use in the manufacture of communication apparatus and equipment for the Bell Telephone System.

27-148. **Ferrous Metallurgy, Volume III: Metallography and Heat Treatment of Iron and Steel.** Ernest J. Teichert. 2nd ed., 577 pp., illus., McGraw-Hill Book Co., New York. $5.00.

Physical metallurgy of iron and steel alloys, metallography and heat treatment; up to date information on equipment and practice in the industry. An index has been included in the revision, and bibliographies have been added to most of the chapters.

27-149. **How to Operate a Lathe.** John T. Shuman and Lewis H. Bardo. 161 pp., illus., John Wiley and Sons, New York. $1.75.

A simple, practical text of the question and answer type. Numerous diagrams, illustrations and tables.

27-150. **Commercial Methods of Analysis.** Foster Dee Snell and Frank M. Biffen. 753 pp., illus., International Chemical Series, McGraw-Hill Book Co., New York. $6.00.

The first four chapters describe the tools needed for analysis and their uses, and the general procedures of sampling, weighing, determination of refractive index and fractionation. The remainder of the volume deals with the actual methods of analyzing various products.

27-151. **Metals and Alloys Dictionary.** M. Merlub-Sobel. Chemical Publishing Co., Inc., Brooklyn, N. Y. $4.50.

Contains over 10,000 useful metallurgical terms arranged in strict alphabetical order. Gives definitions of metallurgical terms, composition, properties and uses of all the important commercial alloys, physical constants and properties of chemical elements, description of machinery and processes used in modern metallurgy, and other pertinent information.

27-152. **Plastic Molding and Plant Management.** D. A. Dearle. Chemical Publishing Co., Inc., Brooklyn, N. Y. $3.50.

Technique of compression and injection molding;

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27-153. **Pyrometry.** William P. Wood and James M. Cork. 2nd ed., 263 pp., illus., McGraw-Hill Book Co., New York. $3.00.

Principles of temperature measurement; construction of pyrometers, thermometers, e.m.f. instruments, recorders, and controlling devices; operation and application of instruments. Corrections, calculations, working tables.

27-154. **Wartime Data Supplement to the American Machinists' Handbook.** Fred H. Colvin and Frank A. Stanley. 154 pp., illus., paper, McGraw-Hill Book Co., New York. $1.00.

Facts and figures on new materials, tools, and methods used successfully in war production. Practical information on feeds, speeds, tool-settings, materials, methods, applicable to a variety of metal-working and machine shop problems.

27-155. **Manual of Machine Shop Practice.** Otis Benedict, Jr. 257 pp., illus. McGraw-Hill Book Co., New York, $1.75.

Helpful material on machine tools, for the student taking a course in engineering shop practice.

27-156. **Handbook for Shipwrights.** H. F. Garyantes. 614 pp., illus. McGraw-Hill Book Co., New York. $5.00.

A guide for shipwrights, reviewing the lines of a ship, the results of welding reaction, and steel construction, and showing, in some detail, the proper lining up of the various parts for structural strength and how to overcome the difficulties that arise when a ship does not conform to the designed lines.

27-157. **Production Handbook.** L. P. Alford and John R. Bangs. 1700 pp., diagrams, Ronald Press Co.. 15 East 26th St., New York 10, N. Y. $7.50.

Organization methods restudied for effective postwar management; job evaluation and merit-rating techniques; time-study, motion-study and training; production planning and control; purchasing; materials control; plant maintenance.

27-158. **Occupational Accident Prevention.** Harry H. Judson and James M. Brown. 234 pp., John Wiley & Sons, Inc., New York. $2.75.

Modern tested methods for preventing industrial accidents and protecting workers.

27-159. **Industrial Radiology and Related Phenomena.** H. M. Muncheryan. 539 pp., illus., Aircraft X-Ray Laboratories, 1600 E. 7th St., Los Angeles 21, Calif. $7.50.

An authoritative guide to modern inspection of aircraft parts, naval structures, and all materials of industry by means of X-rays, gamma rays, micrographic analysis, metallurgical testing, and by Magnaflux methods.

27-160. **Experimental Stress Analysis; Proceedings of the Society for Experimental Stress Analysis, v. II, no. 1,** edited by C. Lipson and W. M. Murray. 225 pp., 8½x11

in., Addison-Wesley Press, Inc., Kendall Square Bldg., Cambridge, Mass. $5.00.

Twenty-one papers presented before the Society's spring meeting in Boston, May 1944, including symposium on residual stresses.

27-161. **Code of Minimum Requirements for Instruction of Welding Operators. Part B-1—Oxy-Acetylene Welding of Steel Aircraft.** American Welding Society, 33 West 39th St., New York 18. $0.50.

Two courses prescribed, one primary and one advanced, with welding exercises and lectures in related welding information prescribed.

27-162. **Glossary of Foreign Welding Terms.** 16-page pamphlet, American Welding Society, 33 West 39th St., New York 18. $0.50.

German, French, Russian and Spanish terms.

27-163. **Der Kampf des Ingenieurs gegen Erde und Wasser im Grundbau.** Arnold Agatz. 276 pp., illus. J. W. Edwards, Ann Arbor, Mich. $9.25.

27-164. **Mikro-Massanalytische Bestimmung des Kohlenstoffes und Wasserstoffes mit grundlegender Behandlung der Fehlerquellen in der Elementaranalyse.** Josef Lindner. 347 pp., illus., J. W. Edwards, Ann Arbor, Mich. $7.15.

27-165. **Eisenlose Drosselspulen; mit einem Anhang uber Hochfrequenz-Massekernspulen.** Joseph Hak. 316 pp., illus., J. W. Edwards, Ann Arbor, Mich. $9.20.

27-166. **Glas.** Hermann Thiene. 2 v. 1120 pp., illus., J. W. Edwards, Ann Arbor, Mich. $28.25.

27-167. **Hochspannungstechnik.** Arnold Roth. 2nd ed., 624 pp., illus., J. W. Edwards, Ann Arbor, Mich. $15.60.

27-168. **Elektronenröhren als Anfansstufenverstarker.** Horst Rothe and W. Kleen. 303 pp. illus., (Bücherei der Hochfrequenztechnik). J. W. Edwards, Ann Arbor, Mich. $8.60.

27-169. **Elektronenröhren als Eng und Sendverstarker.** 141 pp., illus. (Bücherei der Hochfrequenztechnik) J. W. Edwards, Ann Arbor, Mich. $4.50.

27-170. **Handbuch der Metallbeizerei; Nichteisenmetalle.** Otto Vogel. 262 pp., illus. J. W. Edwards, Ann Arbor, Mich. $10.50.

27-171. **Die Knickfestigkeit von Staben und Stabwerken.** Julius Ratzersdorfer. 321 pp., illus. J. W. Edwards, Ann Arbor, Mich. $8.80.

27-172. **Allgemeine und Technische Elektrometallurgie.** Robert Müller. 380 pp., illus., J. W. Edwards, Ann Arbor, Mich. $11.00.

27-173. **Elektrolyt - Kondensatoren; ihre Entwicklung, wissenschaftliche Grundlage, Herstellung, Messung und Verwendung.** A. Güntherschulze and H. Betz. 178 pp., illus., J. W. Edwards, Ann Arbor, Mich. $6.00.

27-174. **Die Federn, ihre Gestaltung und Berechnung.** Siegfried Gross and Ernst Lehr. 136 pp., illus., J. W. Edwards, Ann Arbor, Mich. $4.75.

27-175. **Die Regelung der Kraftmaschinen unter besonderer Berucksichtigung der selbsttatigen Wasserturbinen**

regalung. Gustav Fabritz. 392 pp., illus., J. W. Edwards, Ann Arbor, Mich. $13.00.

27-176. **Elastizitat und Festigkeit im Rohrleitungsbau.** Helmut von Jürgensonn. 353 pp., illus., J. W. Edwards, Ann Arbor, Mich $9.55.

27-177. **Metallographie des Magnesiums and Seiner Technischen Legierungen.** Walter Bulian and E. Fahrenhorst. 108 pp., illus. (Reine und angewandte Metallkunde in Einzeldarstellungen, v. 8.), J. W. Edwards, Ann Arbor, Mich. $4.75.

27-178. **La Filtration Industrielle.** George Genin. 446 pp., illus., J. W. Edwards, Ann Arbor, Mich. $16.00.

27-179. **International Tables for the Determination of Crystal Structures.** 2 vol., rev. ed., 696 pp., illus., J. W. Edwards, Ann Arbor, Mich. $18.85.

27-180. **High-Speed Combustion Engines; Design; Production; Tests.** Peter Martin Heldt. 12th ed. of the Gasoline Motor. 782 pp., illus., diagrs., Nyack, New York. $7.50.

27-181. **Mathematics.** John William Breneman. 2nd ed., 236 pp., diagr., (Penn. State College Industrial Series.) McGraw-Hill Book Co., 330 W. 42nd St., New York. $1.75.

The revised edition includes additional problems.

27-182. **A Manual of Blueprint Reading.** Carl Lars Svensen and William Ezra Street. 98 pp., illus., Van Nostrand, New York. $1.90.

27-183. **Rocket Research; History and Handbook.** Constantin Paul Lent. 102 pp., illus., diagrs., Pen-Ink Publishing Co., 130 W. 43rd St., New York. $5.00.

An engineer and industrial designer, vice-president of the American Rocket Society, explains rocket theory, with illustrations, formulas, tables, and records of actual experiments.

27-184. **The Biographical Directory of American Men of Science.** Jacques Cattell. 7th ed., 2033 pp. Science Press, Lancaster, Pa. $14.00.

27-185. **Simplified Time Study for Factory Supervisors, Shop Stewards and Cost Men.** Herbert J. Myers. 148 pp., illus., Ronald Press, New York. $2.50.

Sufficient information on procedure and records to enable anyone to check or make a stop watch time study of an operation as it is actually being performed.

27-186. **Diving, Cutting, and Welding in Underwater Salvage Operations.** Frank E. Thompson, Jr. 221 pp., illus., diagrs., Cornell Maritime Press, New York. $2.00.

A full presentation of where, when, and how to use equipment for underwater salvaging. Procedure for oxy-hydrogen and oxygen arc cutting, and for electric arc welding under water.

27-187. **Theory and Applications of Electron Tubes.** Herbert J. Reich. 2nd ed., 716 pp., illus., McGraw-Hill Book Co., 330 West 42nd St., New York. $5.00.

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trial electronics, power control, and electric measurement. New developments incorporated.

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A practical discussion of subjects which constitute background knowledge for a departmental manager's attitudes and methods.

27-189. **Commercial Waxes.** H. Bennett. Chemical Publishing Co., Inc., 26 Court St., Brooklyn, N. Y. $11.00.

Data on all classes of natural and synthetic waxes and wax-like materials—properties, sources and uses, handling and compounding. Formulas of commercial materials containing waxes such as adhesives, materials of construction, protective and decorative coatings, etc.

27-190. **New Encyclopedia of Machine Shop Practice.** George W. Barnwell. 576 pp., 1000 illus., Wm. H. Wise & Co., Inc., 50 West 47th St., New York 19. $2.98.

A practical ready reference library and self-teaching home reading course. Describes and illustrates basic machine shop operations. Practical instructions for difficult problems.

27-191. **Procedures in Experimental Physics.** John Strong, H. Victor Neher, Albert E. Whitford, C. Hawley Cartwright, and Robert Hayward. 642 pp., illus., Prentice-Hall, Inc., 70 Fifth Ave., New York 11. $6.65.

Easy to follow explanations, 400 illustrations of exceptional clarity and completeness of labels, and as much theoretical material as needed. Fifteen chapters on technique of high vacuum, Geiger counters, coating of surfaces, optics, materials of research, heat and high temperature, etc.

27-192. **McGraw-Hill Conversion Tables.** Reprinted from Mechanical Engineers' Handbook, by Lionel F. Marks. 12 pp., McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. $0.10.

Conversion factors from U. S. system to metric system for length, area, volume and capacity, mass, pressure, energy or work, density, etc.

27-193. **Arc Welding Engineering and Production Control.** Walter J. Brooking. 345 pp., illus., McGraw-Hill Book Co., 330 West 42nd St., New York 18. $4.00.

A manual of the arc welding process as applied in manufacturing and fabrication, drawing largely on typical industrial experience for a helpful blend of the shop skills and technical know-how required by operators, inspectors, engineers, and others concerned with the use of the process.

27-194. **Metallurgical Analysis by Means of the Spekker Absorptiometer.** F. W. Haywood and A. A. R. Wood. 128 pp., illus., Adam Hilger, Ltd., 98 St. Pancras Way, Camden Rd., London, N.W.I., England. 18s, 0d.

Details of some 26 commonly required metallurgical analyses using the Spekker photo-electric absorptiometer and very rapid and accurate absorptiometric

methods that experience has proved to be well suited to routine use in control laboratories.

27-195. **Sheet Metal Theory and Practice.** John C. Butler. 173 pp., 8½ x 11, illus., John Wiley and Sons, Inc., New York. $3.00.

A concise, practical, tested, self-instruction guide giving methods of handling successfully tools and machines, material allowances, blueprint reading, soldering and fluxes, welded and riveted assembly, used in today's sheet metal shop practice.

27-196. **Aids to Technical Writing.** Richard C. Jordan and Marion J. Edwards. 117 pp., Bulletin No. 21, University of Minnesota, Engineering Experiment Station, Minneapolis. $0.50.

Planning and style; preparation of manuscripts; bibliography, footnotes, equations, tables; drawings, lantern slides, photographs; conversion factors and letter symbols.

27-197. **The Book of Pottery and Porcelain.** Warren E. Cox. 2 vol., 1174 pp., illus. (Lothrop, Lee and Shepard publication.) Crown Publishing Co., New York. $10.00.

A comprehensive, profusely illustrated guide to the history, technique of manufacture and development of china, pottery and porcelain in all parts of the world, including tables of marks.

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